Selective Dissemination of Information: Literature, Researches, and Evaluation

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ABSTRACT

Current research is written in order to present literature, principles, methods, limitations and benefits of methods of selective dissemination of information in cases such as libraries. The dramatic growth of information, keeping researchers up-to-date, saving time and money, and easy access to required information, from the necessity of carrying out this research and the use of information dissemination. In this research, the review of articles, books and current information dissemination systems has been used. Failure to provide diverse facilities, lack of authority over users and lack of satisfaction with them are among the most important limitations of existing information dissemination systems.

KEYWORDS: information dissemination, selective dissemination of information, knowledge management

1   INTRODUCTION

The dissemination of information is part of the information service, which is dedicated to the presentation and transmission of information, especially new and up-to-date information [1]. The information outlines the future status of the future. Geographic dispersion, massive information, speed of updating, thematic diversification of information, interdisciplinary and linguistic diversity are among the most important issues that the information category is facing today. The dissemination of information leads to the achievement of specific information approaches, including moving towards specialization, automation, qualitative, pure information and prediction [2].

1.1   Necessity of Information Dissemination

Awareness of the interests and needs of users and providing relevant, up-to-date and timely information in order to meet their needs are necessity of information dissemination [3].

1.2   Principles of Information Dissemination

In order to realize the presentation of the appropriate information and at the right time to the appropriate user, the following principles should be considered [3]:
1. Information to provide user requirements.
2. Provide or transfer information on time.
3. Information has good quality.
4. The method of presenting information according to the characteristics of the audience.
5. The information needs of users should be continually reviewed.

6. The criterion of the suitability of the information provided is the opinion of the user.
7. The information provided is clear, accurate and easy to understand.

1.3 Selective Dissemination of Information

A selective dissemination of information (SDI) always keeps a person aware of new developments and developments that are relevant to his or her domain. SDI is an informative service and an information tool, but it's not like a newspaper or magazine that gives everyone the same information and equality. The list of information for each individual is distinct and personalized. What is sent to anyone depends on his interests (as outlined in his profile). One of the goals of the SDI is to deliver the right information to the user with minimal effort on his behalf. Each SDI member can, without having to visit the libraries, by visiting his e-mail box or his personal interface page, to receive his latest information based on the personal interests raised in the profile. So, one of the important factors that make SDI services an efficient and effective service is saving time [4].

1.4 Advantages of SDI

Getting the information, you need and interest against a massive amount of information, takes a lot of time and money from each user. In addition to this time and cost, it is still possible to access information that is of particular interest to you, or it may not be possible to obtain all the necessary information. O'Neil states that two main reasons for addressing information services are as follows [5]:
1. Increasing information: Information is tremendously growing and users are limited to searching for their needs and interests. Information services solve this problem.
2. Increasing expertise in all branches of knowledge leads to the availability of information about a topic in multiple sources, and information in a source is also sparse. Information services help to attract and assemble them in a single form.

The SDI screen a large number of documents and thus make the information and selected items exactly relevant to the needs and interests of users. By matching the needs of users with new resources and products, these services resolve their needs and assure them that the selected documents are directly related to current research and have not been ignored, and the list that is displayed has the highest percentage of useful information. So far, the researcher has not been aware of it [6].

1.5 Flowchart of SDI

Housman and Kaskela, list the interests of users and the indexes specified for each document as two main elements of an SDI [7]. The SDI will compare the keywords and topics of the documents with the interest items specified in the profile of users, and the appropriate list is sent to each user weekly, two weeks or months. An SDI flowchart is shown in Figure 1.
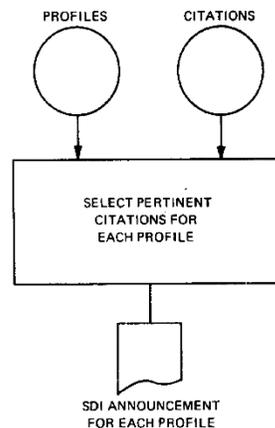

Figure 1: Flowchart of SDI [7]

2   RESERCHES

In this section, research on the SDI, systems, methods, and principles presented in various sources, including books and articles, is dealt with.

2.1   History

Although precise dates cannot be cited for launching SDI services, studies show that this term was first used in 1958 for the digital system. It begins when the person named Hans Peter Lohn of IBM Inc. in 1961 created the first Keyword in Context. This provided him with the establishment of SDI systems in the same year [8, 9].

The first commercially used and widely-deployed SDI service was developed by the US Research Institutions. This automated system, started in 1965 with the Asca brand name, was quickly met with great interest from researchers at various research centres in the United States. That year is the starting point for using machine systems in providing SDI services at research centres. Subsequently, with the passage of time, the use of SDI systems became increasingly important and the number of users of such automated services increased.   Different institutions have used this service. In 2016, the SDI used to provide information services in the medical library [11]. Another study in 2017 used SDI in academic environments. Jensen provides an efficient way of distributing data without having to repeat the distribution data. Yan in his study uses the Boolean function in SDI [14].

2.2   Use of SDI Services in Information Centres

The role that information plays in the community is very important. Information is required for the development of individuals, institutions and society. So, efforts must be made to develop accurate information in a world where information is almost unchecked. SDI service is one of the ways that this can be achieved [12].

Zarbardast explores the ways of SDI services in libraries and information centres in Iran and several other selected countries [15]. He introduces libraries with a variety of information sources that are regularly updated and new sources of information that each user needs to know about the information they need and their expertise. He describes the main problem of users of libraries with high volumes of articles, reports and information, and the solution to this problem is the use of SDI services to determine, detect and clean-up to provide a specific type of information based on the needs of each user. By matching the information needs of users with the new information resources, these services overcome their information needs and assure them that the selected documents are directly related to the current research and have not been ignored, and the list that is displayed has the highest percentage of useful information the scholar has not been informed about it until now. Also, Nkiko and Iroaganachi argued that the main way to meet the information needs of users is to SDI [16]. Other authors also emphasized that SDI has become commonplace as a concept, including the creation of a database of user profiles, their research interests, and the provision of relevant information to them.

In a research entitled "Proposed model for knowledge management in specialized libraries affiliated to the Ministry of Culture and Islamic Guidance in Tehran", it has been shown that digital resource management is inadequate in the areas of the provision, organization and dissemination of electronic information in these libraries. The knowledge of the employees has not been considered as a major asset; the level of knowledge and skills of employees in the use of information technology and electronic publishing is low, and about its tacit knowledge and organization, and the creation of a culture for knowledge sharing and innovation No action taken [17, 18].

An article examines the nature and types of SDI services and information services. Also, the benefits of providing these services are expressed in the electronic environment [19, 20]. Ahani and Azimi in their research consider the significant growth of scientific production as the reason for using SDI services in today's information centres and the relationship between these services and knowledge management. In this

research, they have investigated methods for solving the information needs of chemical engineers working in petrochemical companies based in Mahshahr Special Economic Zone [21].

A method for managing information is presented, which includes five basic steps to identify information needs, obtain information, organize and store information, disseminate information and use information [22, 23]. In a dissertation titled "The SDI System for Faculty Members of Universities and Higher Education Institutions", it has been concluded that after designing and setting up SDI information services, researchers are only once contacted by the Information and Research Services Centre They themselves request information [24, 25]. This way, it saves a lot in time, and researchers get access to updated information in the shortest time. Nosrati Ardakani, in his dissertation entitled "Database design of SDI services for faculty members of Shahid Chamran University based on their views", was used to collect information using a questionnaire. Data analysis revealed that 12 components of 22 components were important for respondents to insert in their profiles [10]. O'Neill, in his master's thesis, addresses the capabilities of the Web environment for SDI services [5]. Souto and Portela point out the importance and necessity of using SDI services in knowledge-based societies. In an article entitled "SDI Applications in the Knowledge Society", conducted in a survey by questionnaires, they found that SDI can be viewed as a tool for long-term and continuous education. Especially in the knowledge society, with the increasing access to information and knowledge, the availability of specific needs and interests of the users is necessary [26]. Horne and Kristensen in an article examine the various ways in which electronic services are used to provide a list of publications based on the interests of users [27].

Horri, in his research on information management indicators, potential and actual use of information, information production, information centres and investment in the information category, by presenting statistics and looking at the country's development plans, concluded that the state of informing the country is not suitable and the information system of the country is not desirable [28]. Another study evaluating users' satisfaction with Jihad Information Centre databases claims that more than 50 percent of users of these databases have been dissatisfied with the speed of access to information and do not consider it appropriate [29], [30]. In another study, the study of the researchers' awareness of the research centres of natural resources in Iran has achieved the following results [31]:

a)   42 percent of people have spent their time in the search phase and gathering information.

b)   86 percent of the study population, have considered appropriate and fast access to information with many obstacles and difficulties.

c)   89.5% of the people said they were not aware of new sources and products at the right time.

Katouzian in his dissertation entitled "Investigating the Relationship between SDI Services and the Attitudes of Faculty Members to Central Library Information Resources in Iran University of Medical Sciences" concluded that most people did not go to the central library (55 percent). The main reasons for non-attendance were the remote location of the library (63.7%) and lack of sufficient time (51.6%). These findings, as well as the lack of awareness of the central library resources provided by some (23.1%), justify the need to use SDI services [32]. Uzohue is dedicated to providing SDI service for medical libraries11. He introduces medical libraries as factors that play an important and vital role in health. Therefore, it recognizes the need for users of medical libraries to be updated with the latest information and access to valuable information. The research is reviewing the libraries of medicine and information and communication technology (ICT) in these. Then the reason for the need for SDI is mentioned. The benefits of SDI services are expressed. Also, Traditional information dissemination methods and how the use of ICT tools and information dissemination services to access reliable, relevant, accurate, up-to-date resources that are required for research, education and study, are described. Adewale examined the role of medical and information libraries and ICT in medical research. Information centres also combine them with the Internet and social media tools to provide creative services, such as informative services and SDI services [33]. Kannappanavar and Swamy noted that each information centre should use a variety of information services to provide relevant information for users [34]. Uzohue stated that SDI's goal is to help users to overcome the massive amount of information. Because users do not have enough time to read and they prefer to access information. The main purpose is to provide users with information needs. Methods and tools for SDI services, including Internet and Web technologies, use of cyberspace, such as blogs, Facebook, YouTube,

e-mail, and more. These tools will make significant advances in information and service provision. With ICT, new information services will have fewer problems in providing information to users. The amount of information produced today is so high that the use of traditional methods is not desirable [11].

According to the stated research, the lack of access to the information needed and favourite, the waste of time, the lack of timely knowledge of the existence of new and appropriate documents and information is the main issues and problems of the users. Therefore, SDI is required to resolve the problems. Zabardast states that the benefits of using SDI are [15]: saving time and money, updating information of individuals and helping them in scientific research and access to the information they need.

2.3   SDI Service Process

Pao believes that the design of all SDI systems is common in several components. These activities include matching users' profiles with related documents, informing, feedback, and reviewing user profiles [35]. Mousavi Chelek also generally introduces SDI services in this way: The requirement for each user, in this section, the user declares his needs and interests; Create user profiles; Select documents based on the needs that each user has announced; Informing and sending resources in appropriate ways, such as telephone notification, informing with the post, informing with e-mail, and providing awareness bulletins. He introduces the final stage as the evaluation of the services provided and the survey of users [36]. Connor in his research categorizes the SDI process into three parts of the system's input, run, and output [37]:

a) System input:
- Information and documents for dissemination.
- Descriptors that provide information about the user's interests and needs.
- Feedback received from users (which shows the degree of relevance of the documents declared with the research interests of users).

b) Run process:
- Match descriptors introduced by users with document descriptors.
- Selection of documents required by the user.
- Modify user profiles based on user feedback.

c) System output:
- Send selected documents to the user.
- Statistics that show the performance level of the system.

Bivona and Goldblum in their report define an SDI system as the system that has the following essential components and features [38]:

a) System input:
- Any information (for dissemination) that can be expressed by a string of characters.
- Defining the information required by the users.
- List of users' addresses.
- Feedback from users.

b) Run process:
- Match the information the user needs with the content of the document.
- Edit user profiles based on their feedbacks.

c) System output:
- Descriptions of documents that are selected and addressed in (b).
- A statistic that shows the operational characteristics of the system.

Adeniran examined the nature of the SDI service that was used in the University Library [12]. According to his study, a form entitled "Educational and Research Profiles" will be sent to members in order to access details such as: name, email address, phone number, faculty, research area, educational profile, and other related information. From the information entered in the email, the user profile is created for SDI purposes. Librarians look for relevant databases and other online resources based on the user's interests. Search results are sent via email to users. The system allows for feedback that users can express

their opinions about the relevance of documents to their needs. He describes SDI service components as follows:

a)   A form is sent to users through email, in order to receive information and identify areas of interest for establishing their profile.

b)   Selected information is sent to users whose profiles have been established by e-mail.

c)   Feedback to the library in order to understand the appropriateness of delivering information to users.

The processes of SDI services are described in more detail on the basis of various studies.

2.3.1   Create User Profiles

Profile formation for the user is the first step in the process of providing SDI services [15]. Jaber Hossain recognizes the user's needs and interests as an essential part of information retrieval. The user profile contains information about the user that specifies his / her information needs [39]. Pao describes the purpose of creating a user profile to describe the information needs of a user by a group of keywords.35 The profile can be divided into two main types [15]:

1. Organizational Profile: A profile is formed to meet the organizational and research needs of a center or organization.
2. Professional profile: This kind of profile is used in the Information Centers and the SDI Service Provider with a specific exploration approach (for each person).

Jafar Beiglou identifies the components of the profile as follows [40]:

1. Personal information: includes name, surname, age, gender, degree, field of study, etc.
2. Subject information: Includes favorite keywords.

Also, Jaber Hossain considers the components of the profile as follows [39]:

1. Information about the user's identity including name, address, telephone number, and e-mail.
2. User experience information includes: field of study and level of education, occupation and related experience. The information in this section clearly helps to collect qualitative information on user knowledge and skills.
3. Information about the user's interests, which forms the essential part of the user profile, and the documents associated with the user's needs are retrieved, scanned and sent. This section may include the following:
    a)   Determine the subject's main scope: To do this, you need to determine the main topic and the sub-topics and keywords that specify the topic and issue required.
    b)   The purpose of the research, the scope of the publication, the target language and references.
4. Computer skills level: This option is essential for finding user skills in using computers and sending information.
5. How to send the required user documentation: This option is related to the type of information the user wants, the form of information and the method of delivery of the information desired by the user.
6. Time period for sending documents: This is an important option in the profile that determines the time period for sending information (weekly, two weeks, monthly, etc.).

2.3.2   Matching

Pao states that each SDI system has two main inputs, one of which is the user's needs, and the other is information (documents) [35]. At specified intervals, depending on the system policy and the periods of data entry to it, the user's keywords are aligned with the documents, and wherever they are matched, the document code found in the profile is stored and its associated specifications the document is sent to the profile owner. Housman and Kaskela, examined one hundred of SDIs in the United States and outside

America [7]. Of the reviewed systems, the Boolean matching function was the most used technique for matching documents with the interests of users.

2.3.3   Informing

The documents or abstracts that are retrieved on the basis of profile are delivered to the user in order to informing his favourite document. This content may be in the form of a printed version or a page with the title of the documents. Sending a document can also be done by email. Each document sent to the user is placed on its subject. One of the things to keep in mind is when to notify the user, what information is sent to him about the proposed document. Bivona and Goldblum have identified three components for informing, which are [38]:

1.   Descriptive cataloguing information (title, author name, journal name, etc.).
2.   Keywords
3.   Abstract

Another point in the notification section is to prioritize the results. The sorting of retrieved results is done in a variety of ways, but the three most commonly used solutions in the electronic retrieval are:

1.   Alphabetical order
2.   Degree of relevance
3.   Publication date

2.3.4   Methods of Sending Documents

The methods of sending documents to users can be done as follows [4]:

1.   Post
2.   Email: The availability and affordability of e-mail has transformed this approach into the most common form of SDI service.
3.   Send to user's personal page: This method is also very much considered. Pages are a possibility that some information systems provide to their users. These spaces are graphical interfaces for which the user can store, maintain, or delete specific information from the SDI service.

2.3.5   Feedback

This component of SDI evaluates system performance. Based on this assessment, the components of the system can be modified. Feedback may have different types. Feedback and response to any information provided to the user may be in writing or verbally. Feedback should be required at least time and effort by the user. Many organizations accompany sent documents attach a return postcard to receive feedback information [35]. Wood and Seeds argue that the type of service and its degree of satisfaction depends on the specific circumstances of each information centre or library as well as users [41]. Therefore, any changes or new decisions in the provision of services should be carried out by specific studies and research, and users should be consulted.

Housman and Kaskela, collected a partial survey of 100 SDIs in the world. These systems have been based in universities, industry and government environments [7]. A survey was conducted by subscribers of the US Army Electronic Station that received SDI services for six months or more. Distribution of their views on the usefulness of this service for various criteria was presented in Figure 2.

Question:

"Please indicate below the effect this service has had on your work. Check appropriate items."

Answer.

89%	Revealed valuable documents that probably would not have been discovered by subscriber
69%	Saved time in literature searching
34%	Revealed other persons working in area who later provided information of value
28%	Affected technical decisions in work area
27%	Increased productivity
20%	Revealed duplication of effort
20%	Shortened time required to complete a particular task
14%	Indicated some anticipated work was unnecessary
4%	Changed course of work
3%	No benefit.

Figure 2: Distribute comments on the usefulness of the SDI service [7]

As can be seen, most respondents introduced the "Knowledge of valuable information not received so far" and "improve the speed of access to information" from the benefits of this SDI system, and only a very small number the system has no benefit.

Adeniran reviewed an SDI and analyzed its feedback [12]. This study reviews and evaluates the SDI service of Redeemer University. Considering how this research works, the method used to review SDI, feedback and analysis can help us to get a model for feedback and how to evaluate the system. The data used for this research is based on the three-year information provided by the Redeemer University Library. Data is used to analyze the SDI library service, especially the user category, research interests, and user feedback for the academic year 2013/2014 through 2016/2017. The statistical population of the study was 135 students. Table 1 shows that in the 2013/2014 academic year, a total of 22 students used SDI library services. Out of these, 22 (100%), 4 (18.2%) of the human faculty, 14 (63.6%) were from the Faculty of Management Sciences and 4 (18.2%) from the Faculty of Natural Sciences. During the 2014/2015 academic year, the SDI service is not used by students. In the 2015/2016 academic year, out of a total of 39 students using the SDI service, 7 (17.9%) were from the Faculty of Humanities, 24 (61.5%) were Faculty of Management Sciences and 8 (20.5%) were from the Faculty of Natural Sciences. In the 2016/2017 academic year, out of 5 students using SDI, 2 (40%) were from the Faculty of Humanities, 3 (60%) from the School of Management Science, and not any student from the Natural Sciences Faculty use SDI during this period. Table 1 shows that most students who use SDI during the course of study have been from the School of Management Science. During the 2014/2015 academic year, the SDI service was not used by students at Redmeemer University. The reason is the change of the University's temporary site to the permanent site in this period. In total, 66 out of 135 students at these three colleges have used the SDI service during this study period. Finally, statistical results indicate that students did not seek to use the SDI service. The SDI service can give students access to the latest information related to classroom assignments, write articles, and enhance classroom information. Failure to use the service by students can be due to "lack of knowledge of service ability" or lack of interest among students. Therefore, in SDI design should be taken into consideration: informing people about the SDI's capabilities, teaching how to use the system to increase the accuracy of the desired information needed, planning for designing an easy and user-friendly model.

Table 1: Distribution of users using the SDI service [12]

College	2013/2014	Percentage	2014/2015	Percentage	2015/2016	Percentage	2016/2017	Percentage
Humanities	4	18.2	0	0	7	17.9	2	40
Management Science	14	63.6	0	0	24	61.5	3	60
Natural Sciences	4	18.2	0	0	8	20.5	0	0
Total	22	100	0	0	39	99.9	5	100

Table 2 shows that 66 (100%) have used the SDI service for the purpose of research. The SDI service is not used for things such as providing lecture notes.

Table 2: The goals of SDI users [12]

Purpose	Number	Percentage
Research	66	100
Preparation of lecture notes	0	0
Additional information	0	0
Total	66	100

As shown in Table 2, research was the purpose of students' use of the SDI service. This result was expected based on the fact that research was one of the main goals of a university. Therefore, in designing an SDI system, the needs of the majority of users should be taken into account and the creation and collection of information in line with the needs of the majority of contacts to attract more users' attention. Also, Adeniran recommend the following to improve SDI and provide better services [12]:

1. SDI management should try to get feedback and comments from users who use the SDI service to try to further improve it.
2. SDI management should investigate the reasons for individuals or groups that have not been members of this service and how to encourage them to join the service.

Individuals should be properly informed about the benefits of the SDI service.

Resnick and Hensley gave feedback on the number of notifications. In their research of 45 IBM scholars, they found that most users do not want to limit the number of notifications they receive. 30 percent point out that the number of received notifications is too high. It should be noted that in the subjects studied, the average number of notifications received per week was 3.5, although there was a significant variation among users [42]. However, in cases where the number of notifications is high, some users may want to limit the number of notifications received.

Hoshovsky and Downie, in their research on the novelty of documents for the user, and whether the user has seen previously reported cases, said that according to a survey, it is estimated that 90% Notifications that users received from the SDI were information that they had never seen before and were new to them [43].

Bivona and Goldblum studied how to receive feedback and design forms. According to them, most systems use a form to determine the extent to which the content is communicated with the user's interests. Most forms use at least four positions to specify whether or not notifications are relevant [38]:

a) It was a favorite and the document was needed.
b) Favorite, not required document.

c) Been a favorite, has already been seen.
d) Not interested.

Also, Bivona and Goldblum suggested using three measures to evaluate the performance of SDI systems [38]:

a) Relevance and Recall Ratio: The relevance ratio, the ratio of the number of documents that are appropriate and related to the number of sources that are selected and announced. For example, if the system selects 100 documents, but only 25 of them are relevant, the relevance ratio is 25%. The recall ratio is the ratio of documents selected to the entire document in the system. For example, if 100 documents are in the system but only 5 are selected, the recall ratio is 5%.

b) Dissemination Ratio: The ratio of the average number of notifications sent to the total number of documents reviewed. For example, if 1000 documents are reviewed and an average of 100 notifications are sent to each user, the dissemination ratio is 10%.

c) Selection-Participation Ratio.

In an ideal system, the features mentioned are that: the relevance ratio is high, the recall ratio is high, the dissemination ratio is medium, and the ratio of the third criterion is also high. If the dissemination ratio is high, almost all incoming documents are disseminated to each user. This indicates that there is no need for SDI, since users accept almost all input documents.

2.3.6   Review and Modify Profile

Changing or modifying the subject matter of the research or the differences in the requirements of each user may be due to reasons for requesting correction of the profile by the users of the service [44].

2.4   The Study Conducted on the SDI Service Process of 16 Information Centres

Zabardast and Shokoohian investigated SDI services in libraries and information centres in Iran. The statistical population in this study is 16 centres of SDI service in Iran that provide SDI services. The information centres studied in this study are [20]:

1. Research Centre of Islamic Republic of Iran Broadcasting
2. Agricultural Research
3. Library of the Deputy Director-General for Planning and Strategic Presidency
4. Library of the Central Bank of the Islamic Republic of Iran
5. Library of Oil and Energy Information Network
6. Digital Library of Isfahan Municipality
7. Library of Isfahan University of Art
8. Central Library of Birjand University
9. Library of Imam Reza University
10. Central Library of Arak University
11. Central Library of Shahed University
12. Library of the Faculty of Educational Sciences and Psychology, University of Tehran
13. Central Library of the School of Water and Power Industry
14. Library of Shiraz Science and Technology
15. Islamic Information and Documentation Centre
16. Iranian Science and Technology Research Centre

They divided the documents used in libraries and information centres into three types: print sources (books, publications, dissertations, reports, etc.), electronic resources (information stored on compact discs, Databases, etc.) and digital resources (resources prepared for use in digital libraries). Libraries, based on their policies and goals, use these resources to provide services to their users. Table 3 shows the results of their study findings regarding the type of source used in the 16 mentioned information centres.

Table 3: The findings of the source type used in the 16 information centres [20]

Options	Electronic resources	Print resources			
		Book	Magazine	Table of contents	List of news
Yes	13	2	1	3	2
	81.2 %	12.5 %	6.2 %	18.8 %	12.5 %
No	3	14	15	13	14
	18.8 %	87.5 %	93.8 %	81.2 %	87.5 %
Total	16	16	16	16	16
	100 %	100 %	100 %	100 %	100 %

According to their findings, the use of electronic resources is the highest (81.2%) and the use of print resources is the lowest (18.8%). A center for providing services uses only print resources (Central Library of Arak University) and two centers, along with electronic resources, also use print resources (Library of Isfahan University of Art, and Library of the Central Bank of the Islamic Republic of Iran).

Zabardast and Shokouhian at the next stage of their research study the methods of collecting information from users and profiling in 16 SDI service providers [20]. In this study, it was found that in 13 centers (81.2%) of SDI service providers, the user profile was created electronically. Zabardast and Shokouhian went on to study how SDI services were implemented in these 16 information centers which is presented in Table 4 [20].

Table 4: Findings from the study on how SDI services are implemented in the 16 information centres [20]

Phase	Option		frequency	Percentage
Run	Matching information resources with user requirements	Matching and selection by expert	9	56.2 %
		Matching and selection by computer	7	43.8 %
Output	Notify method	Email	14	87.5 %
		In person	5	31.2 %
		Telephone, user personal page, office automation	4	25 %
		Information bulletin	2	12.5 %
	Providing statistics	Monthly	6	37.5 %
		Yearly	9	56.2 %
		Monthly-Yearly	4	25 %

2.5   Information Dissemination Methods

Because individuals and organizations differ in terms of needs, levels and financial considerations, information is disseminated in a variety of ways. Rouhidel described the methods of disseminating information using the Internet, forming newsgroups, exchanging specialized knowledge, setting up an information publication, and accessing information on the website. Information dissemination methods are classified into several categories in terms of the type of media and resources, and each one includes a variety of different types that are described in following.

2.5.1   Non-Electronic Dissemination of Information

In this way, a variety of information resources are disseminated manually. Such as sending printed materials, face-to-face communications, telephones, and so on. The low speed, due to its traditional performance, has led the way to respond to a small number of users [15]. Uzohue introduces the traditional methods used to disseminate information in libraries as follows [11]:
1. Insert new documents on the shelves in the library to view people.
2. View content from new documents and books on bulletin boards.
3. Informing through newspapers

Aderinan also explains the traditional SDI methods. According to him, in a traditional way, information is disseminated to the target group or individuals in the following ways [12]:
1. New documents are placed on a library rack to observe the users.
2. Display the contents of the new books, which are in the bulletin board.
3. Newspaper pieces on the shelf to empower researchers and library users to access the latest information and advancements in their area of interest.
4. Awareness through library authorities when new content is acquired in a specific field for some sectors.
5. Collection of lists, indexes, and abstracts of books, displayed periodically to provide information to users.

2.5.2   Semi-Electronic Dissemination of Information

In this way, the information dissemination service process is carried out in the same way as the traditional one, except that some steps are taken to implement this process by computer [15].

2.5.3   Electronic Dissemination of Information

The use of electronic methods has advantages such as the possibility of using the network environment, high transmission speed, resource sharing and cost savings, low storage capacity, easy data reproduction, the ability to use multimedia technology and many other benefits [2].

The use of information technology in SDI systems, in addition to a lot of improvements in the speed, accuracy and coverage of information, has also reduced costs [43].

These technologies focus on the use of ICT tools and their applications to serve users to use a variety of methods in SDI services. Information centers and libraries use ICT tools to collect information, process, evaluate, analyze and disseminate information to meet the needs of users. The dissemination of electronic information is done in a variety of ways, including some of them [11]:
1. Internet and Web technologies: Today, the use of the Internet and the World Wide Web has grown strongly in order to search and share resources. The Internet and Web technologies provide an easy way to serve users. The Internet has been very influential in the dissemination of information. Almost all of the components of information dissemination, such as notification, information search with speed, and accuracy are possible through internet. The Internet, a global networking system with various services and applications, has now become a huge source of information that has a huge impact on information services such as SDI.
2. Email: Email is a way to send messages to users. Email is a method of writing, sending, storing and receiving messages on electronic communication systems. By email, users frequently retrieve their interest domain.
3. Using social networks: It is a kind of creative service with the latest technologies that are used to create popular and user-friendly services. Using social networking like LinkedIn, Myspace, Facebook, Twitter, YouTube, etc., offers ways to collaborate, communicate and share information with a wide range of other people. Social networking allows individuals to create profiles for themselves and share them with other users with similar interests.

4. Database: A large number of linked databases can provide SDI services to users. For example, databases such as Elsevier, Science Direct, Academia, Scopus, e-journals, e-books and more. Some of these databases allow for automatic alerts. Once registered, you can automatically receive an email or RSS feed every time the database is updated.
5. Mobile services: When a new user comes to the library, it is suggested that the name, telephone number and research interests be entered and recorded for better service. To send information to users on SDI services, a personal text message should be used. This is an easy, inexpensive and fast way to provide information to people who need this information and use mobile phones. Also, with mobile phones, users can subscribe to informational applications.

3   ADVANTAGES AND DISADVANTAGES OF EXISTING METHODS

This section analyses some of the ways outlined in the use of information dissemination services in information centres, and explains the advantages, disadvantages and limitations. Although some of the phases have been considered when presenting existing methods, and for each phase, the status, advantages, disadvantages and limitations are mentioned, this section outlines important points. Table 5 summarizes the advantages and disadvantages of comparing some of the existing methods described in the previous sections.

Table 5: Compare SDI existing methods, advantages and disadvantages

Researchers	Brief description	Advantages	Disadvantages
Yan [14]	In a study, he used the Boolean function in SDI.	The use of SDI and matching function to inform according to the interest and needs of each user is one of the benefits of this research.	The use of a particular type of matching function does not satisfy the user's satisfactory results, and it is necessary to use several matching functions, and the choice and decision regarding the number and type of matching functions used by the user who is most aware of his need, be placed.
Entehaei [17]	In his research, he proposed a model for information management in specialized libraries affiliated to the Ministry of Culture and Islamic Guidance in Tehran.	1. Employees' knowledge was considered as a major asset. 2. The level of knowledge and skills of users increased in the use of information technology and electronic publishing to achieve better results.	1. Different matching functions were not considered. 2. The number of notifications was fixed and determined by the system. 3. Users did not have the ability to specify the content of the notifications. 4. How to arrange the announcements was not considered.
Ahani & Azimi [21]	In this study, they investigated methods for solving the information needs of chemical engineers working in petrochemical companies based in Mahshahr Special Economic Zone.	The quick and easy access of engineers of Mahshahr petrochemical companies to the required information among the massive amount of scientific materials.	1. Failure to provide feedback to the system. 2. Unable to feedback to notified documents 3. Failure to authorize the user to determine the settings of the SDI system and thus fail to obtain results that are exactly intended by the user.
Jafar Beiglou [24]	He designed the national SDI system for faculty members at	Researchers only specify the required information once. This way, it saves a lot in time, and researchers get access to	Not considering various services, such as identifying similar users and recommending documents based on similarity of users,

	universities and higher education institutions.	updated information in the shortest time.	different matching functions, training and awareness about how to use the system to achieve better results.
Nematollahi [46]	He provided SDI services to faculty members at Shiraz University in the Library of Science and Technology via e-mail.	Use of electronic informing techniques to increase the speed of information dissemination.	The use of only one informational method such as e-mail will cause system performance down. Because some users may not have the e-mail or don't know how to use it, and prefer traditional ways. Also, some users may have a low review rate for e-mail and prefer other methods like SMS, social networks, and so on. So, there must be a variety of features, and it is up to the user to determine the manner of informing.
Nosrati Ardakani [10]	He designed the database of SDI services for the faculty members of Shahid Chamran University based on their comments. He analyzed the questionnaires and found that profile design is important to them.	Consider specific profiles for each user, in order to achieve more relevant results.	To achieve better results, the user should be able to determine the settings and type of service in all SDI components.
Horne & Kristensen [27]	They examined various electronic services for sending documents.	The use of electronic methods to increase the ease and speed of access for users to their favorite information.	Some users may prefer traditional post delivery methods to electronic methods. Therefore, in order to increase satisfaction and willingness of the audience to use SDI, it is necessary to use both electronic and traditional methods of sending documents, and the user chooses the type of posting.
Katouzian [32]	He examined the relationship between SDI services and the number of referrals to the information resources of the Central Library of Iran University of Medical Sciences.	He realized by analyzing the data that the researchers did not go to the central library for the following reasons: 1. Library location is far away 2. Not having enough time 3. Lack of knowledge of library resources By creating SDI, he was able to solve these problems.	Some users are unaware of how to use SDI and its settings and features. Therefore, appropriate training for all SDI components should be considered.
Uzohue [11]	He used ICT, its methods and tools, including Internet and Web technologies, cyberspace such as blogs, Facebook,	Using different e-methods, such as email, social networks, etc., and relying not only on one way, will increase the user's satisfaction and the desire to use SDI.	Because some users prefer using traditional methods to electronic methods, it should be possible to use both methods to increase user satisfaction, and the user be the decision maker.

	YouTube, email, etc. for SDI services.		
Pao [35]	In his view, SDI components are: matching, informing, feedback, and modifying.	Provide features such as feedback for SDI	More specifically, things like the types of feedback, the types of matching functions, the number of notifications, the content of notifications, the order of announcements, the methods of sending documents, etc., are to be considered in SDI.
Mousavi Chelek [36]	He defines SDI services as: identifying the needs of each user, creating user profiles, selecting documents based on the needs that each user has declared, informing and sending documents.	Considering features such as different ways of informing and sending documents.	In addition to the need to consider a variety of features in other components, such as matching functions, the training should be considered for the use of various SDI components.
Adeniran [12]	According to his study, the form "Educational and Research Profiles" will be sent to members in order to access details such as: name, email address, phone number, research area and other related information. This information is used to create user profiles. Librarians then look for relevant databases and other online resources based on the user's interests. Search results are sent via email to users.	The design of this system includes features such as providing feedback to SDI for system modification.	1. The interests and research needs of users may change over time. Therefore, the profile must be editable and the user can make this edit. 2. Selected documents are only e-mailed. Other types of informing such as informing through social networks, etc., should also be considered for the satisfaction of users.
Zabardast [15]	He divided the profile into two main types: 1. Organizational Profile 2. Professional Profile	Considering a variety of profiles to meet organizational and professional needs.	The user must be able to edit the profile. Also, the editing process should be done quickly and easily through the user.
Jaber Hossain [39]	He described the components of the profile as follows: 1. Information about user identity. 2. Information about user experiences. 3. Information about research interests. 4. Skill level in computer work.	Getting information in more detail from users can provide documentation tailored to the user's interest and the result of the user's expectations and satisfaction.	1. Other information is required, such as the determination of the content of the document being notified, the order of the notifications, the method of sending the document (post, electronic, etc.), etc., from the user to receive his expectations. 2. The information received from the user should be used effectively to achieve better results. For example, the information that was

	5. How to send documents. 6. Number of notifications at a time period.		received relates to user conditions and experiences (including field, level of education, occupation, etc.) to identify similar users and to predict their desires (which they were not able to fully express).
Library of the Faculty of Entrepreneurship, University of Tehran	In this library, using a form, information such as name, section, phone number, training group, e-mail address and research interests (in the form of a keyword) are received.	Possibility to determine the type of source requested, including a book, article, dissertation, report, etc.	1. It is possible to receive information from the user only in the traditional way and using the printed form. 2. Ability to edit information (for example, favorite keywords) is not available to the user. 3. In the form used, only the matching function used is "the Find Document that has all the declared keywords of the user"; and there is no use of a variety of other matching functions, such as the matching function based on the weight and importance of the keyword or its location in the document. 4. The user cannot make adjustments such as author name, content, number and order of notifications, etc.
Bivona & Goldblum [38]	They considered three essential elements for the content of the notifications: 1. Descriptive information (title, author name, journal name, etc.) 2. Keywords 3. Abstract	Essential parts are considered in the content of the notifications.	For users' satisfaction, there must be a variety of content for notifications, and it is up to the user to determine its type.
Radfar [4]	The presentation of the SDI system, the only new information reaching the center, is sent to users based on their research interests.	Selective dissemination of new information and documents.	The user must be able to set the time limit for the documents of interest; and notification is not limited to new documents. This will increase the user's satisfaction in accessing the expected information and thus increase their willingness to use SDI.
Housman & Kaskela [7]	They collected a survey of 100 SDIs in the world. These systems have been in universities, industry and government environments. A survey was conducted by	Most respondents introduced the benefits of the SDI system as follows: Awareness of valuable information that they have not received so far and improving the speed of access to information.	As feedback from the system is prepared and analyzed, feedback should be examined and analyzed in relation to the disseminated documents; and there should be two types of feedback: 1. Feedback on the system and its facilities, in order to improve them.

	subscribers that SDI services were used for six months or more.		2. Feedback on notified documents to improve results.
Adeniran [12]	He reviewed the SDI of the Redeemer University and analyzed it.	Feedback from users.	The lack of SDI service by students was due to "lack of awareness of capabilities, facilities and how to use the system". Therefore, notifying people of the SDI's capabilities, teaching how to use the system, planning for designing a model with ease and user-friendliness to attract more users should be taken into consideration.
Resnick & Hensley [42]	In their research, they analyzed the views of IBM scholars on the number of SDI notifications. Approximately two-thirds of the cases examined did not seek to limit the number of notifications per week. It should be noted that in the subjects studied, the average number of received notifications per week was 3.5.	Review user feedback on the number of notifications to increase their satisfaction and their willingness to use SDI.	1. In order to increase user-friendliness, it is best for the user to decide on the number of notifications instead of the system. 2. User comments in all SDI sections should be considered, such as the content of the notifications, the order of announcements, the type of matching functions used, and so on.

4   CONCLUSION

In this paper, the concept of SDI, its necessity, its principles and its goals were discussed. Existing SDI methods are expressed in terms of different phases. The existing methods were analyzed. The main advantages of the existing methods for providing information dissemination services at the information centers are:

1. The use of the majority of information centers from ICT in providing information dissemination services: In most centers, electronic and semi-electronic methods for providing services are used. Even in semi-electronic modes, the electronic parts section has been more than traditional. This will increase the speed of the information dissemination system and reduces costs.
2. Feedback: Most of the existing methods used feedback in providing information dissemination services. Feedback, in addition to knowing the system problems and correcting them, raises user satisfaction due to the user's value and, as a result, is user-friendly and encourages him to make more use of the information center.
3. Checking system statistics and charts: Using statistics and charts of important criteria, such as the recall ratio, will raise awareness of the system's performance and help management to make the right decisions to increase efficiency.

The most important disadvantages and limitations that exist in existing methods include:

1. Failure to identify audience needs: In the absence of knowledge of the needs and interests of the majority, it will lead to: production of documents that do not have many enthusiasts, and the inability to meet the needs of users.
2. Using one type of matching function and by default by the system: In existing methods of SDI systems, a function is usually used to match the attributes of the document with the interests and

needs of users, which is the default matching function defined by the system. In the functions used, it is not possible to determine the keyword's place in the document (title, abstract, key words, inside the text, etc.). A keyword may also be more important to the user than other keywords, and in fact, he or she wants to weight the keywords based on their importance; there is no such possibility as well as many other things, such as determining the author of the document, etc., in the existing information dissemination systems.

3. Failure to assign decisions to the user: Almost all of the existing SDI systems in the existing methods are the system that decides which matching function to use, the number of notifications in a given time period (such as weeks, months, etc.), what type of forwarded format, and so on. Assigning decisions to the user, in addition to satisfying and user-friendliness, leads to more accurate decisions for each user based on the recognition of their own needs and interests, and will therefore receive expected notifications and services.

4. Lack of recommended systems: In addition to the keywords and things that the user identifies as his interests and needs, and thus the matching for the product announcement, there must be a system for checking the similarity of the users to each other (based on various indicators, such as keyword selections, age, gender, location, records And so on) and recommending a document to the user if that product is in the interest of his/her similar users. Because the user may not have sufficient ability to use the functions of matching and expressing his needs, this method can achieve the documents that are likely to interest them.

5. The lack of facilities and services that encourage people to use the SDI system: For example, you can consider an option in the user profile as a friend's invitation and give the inviting user special services.

6. Failure to use system training: As outlined in the existing methods section, many people do not create profiles and provide the needs because they do not know how to use SDI. Also, people who have formed profiles cannot fully access the services they are looking for due to lack of understanding of how to use matching functions and other system features. Therefore, it is necessary for each part of the system to teach how to use it.

7. Failure to adhere to simplicity: It is true that there should be plenty of facilities to offer a variety of services, but care should be taken for the simplicity and ease of use. Users tend to express their requests and desires with ease and with the least need for training.

REFERENCES

[1] Kumar, Krishan. "Reference Service". *New Delhi: Vikas Publishing House PVT LTD*. 1989.
[2] Yousefi, A. "Comparative Study on subject Trends in LIS Articles between Iran and ISA Database". *National Library Studies and Information Organization*. 11 (4). Winter 2001.
[3] Trench, Stella. "Dissemination of information." Handbook of Special Librarianship and Information Work. London: Aslib. 1997.
[4] Radfar, H, R. "Web capabilities in the selective dissemination of information". *National Library Studies and Information Organization*. 2006.
[5] O'Neil, Edward K. "Selective dissemination of information in the dynamic web environment". Diss. University of Virginia. 2001.
[6] Schneider, John H. "Selective dissemination and indexing of scientific information." *Science* 173.3994. 1971: 300-308.
[7] Housman, Edward M., and Elaine D. Kaskela. "State of the art in selective dissemination of information." *IEEE Transactions on Engineering Writing and Speech* 13.2. 1970: 78-83.
[8] Yousefi, A. "Dissemination of Information". *Encyclopedia of Library and Information Science*. 2002.
[9] Sayyadifar, S., and M. Farrash-Bashi Astaneh. "Social status of librarians: challenges and working procedures". *National Studies on Librarianship and Information Organization*, 17 (1). Spring 2006.
[10] Nosrati Ardakani, A. "*SDI database design for faculty members of Shahid Chamran University based on their comments*". Faculty of Education and Psychology, Shahid Chamran University of Ahvaz. 2007.
[11] Uzohue, C., and J. Yaya. "Provision of current awareness services and selective dissemination of information by medical librarians in technological era." *Am J Inf Sci Comput Eng* 2.2. 2016.

[12] Adeniran, Pauline Oghenekaro. "Content analysis of selective dissemination of information service (SDI) adoption by academics: The experience at redeemer's university." *The Reference Librarian* 59.1. 2018: 56-63.

[13] Jensen, Daniel, and Ulf Ahlenius. "Intelligent information dissemination." *U.S. Patent* No. 9,552,609. 24. Jan 2017.

[14] Yan, Tak W., and Héctor García-Molina. "Index structures for selective dissemination of information under the boolean model." *ACM Transactions on Database Systems (TODS)* 19.2. 1994: 332-364.

[15] Zabardast, M. "Discriminatory information services and the proposed model for its presentation". *Electronic Journal of Libraries and Museums and Documents Center of Astan Qods Razavi*, 2 (9). 2010.

[16] Nkiko, Christopher, and Mercy A. Iroaganachi. "Community-focused selective dissemination of information services for empowering women through information provision and utilization: Center for learning resouces as a catalyst for social change". 2015.

[17] Entehaei, A. "Proposed model for knowledge management in specialized libraries affiliated to the Ministry of Culture and Islamic Guidance in Tehran". Master's Degree in Library and Information Science, Islamic Azad University, North Tehran Branch. 2002.

[18] Rostami, Z., J, Nasimeh., A, Alaghemand. "Librarians' outlook on the infrastructure of technology in the application of knowledge management in the state university libraries of Babol". *Journal Management System*. 1 (1). Winter 2015.

[19] Kiani, H. "National Planning for Managing Development of CAS Services and SDI in Iranian Specialized Libraries". *Proceedings of the 9th Conference of Librarians of the Organization for Management and Planning*. 2007.

[20] Zabardast, M., and H, Shokoohian. "Selective Dissemination of Information Services in Libraries and Information Centers of Iran: A Comparison with the Aim of Presenting an Appropriate Model ". *National Studies on Librarianship and Information Organization*, 23 (3). Autumn 2012.

[21] Ahani, S., and M. Azimi Pour. "Propagation of Selected Information (SDI) A New Approach to Knowledge Management, Experience of Mahshahr Petrochemical Industries". *Second National Knowledge Management Conference*. Tehran: Razi International Conference Center. 2009.

[22] Choo, Chun Wei. *Information management for the intelligent organization: the art of scanning the environment*. Information Today, Inc. 2002.

[23] Sabbaghinejad, Z., and Gh, Heidari. "15 definitions of Information Management (IM)". *Journal of Studies in Library and Information Science*, 22 (16). Winter 2016: 39-58.

[24] Jafar Beiglou, M. "*National SDI System Design for Faculty Members of Universities and Higher Education Institutions*". Master's Degree in Library and Information Science, Faculty of Psychology and Educational Sciences, University of Tehran. 1998.

[25] Fadaei, G., F, Fahimnia., S, M, Hosseini., and A, Akbari. "Project for Establishing a Selected Dissemination of Information Service for the Faculty Members at Education and Psychology Faculty"., *Processing and managing information*, University of Tehran, 27 (1). 2012: 420-437.

[26] Souto, L. F., and P. O. Portela. "Application of SDI in knowledge society: Education and training through the universities". 2002.

[27] Horne, Angela K., and Terry L. Kristensen. "The development of MyContents, an enriched electronic tables of contents service." *portal: Libraries and the Academy* 4.2. 2004: 205-218.

[28] Horri, A. *National Information System Design, Organization, Planning and Development*. Tehran: Center for Information and Scientific Services for Jihad-e-Sazandegi. 1997.

[29] Khosravi, J. "Satisfaction of users of CD-ROM databases of Ministry of Information and Science Services of Ministry of Jihad-e-Sazandegi". Master's thesis, University of Tehran, Faculty of Education and Psychology. 1996.

[30] Jafar Beiglou, M. "Selective Dissemination of Information: Proposal for a National Plan". *National Studies on Librarianship and Information Organization*, 11 (1). Spring 2000: 32-50.

[31] Hakimi, H. "Investigating the Information Behavior of Researchers in Natural Resources Research Centers in Iran". Master's thesis, University of Tehran, Faculty of Education and Psychology. 1996.

[32] Katouzian, M. "Investigating the Relationship between Disseminated Information Services and the Attendance of Faculty Members to Central Library Information Resources in Iran University of Medical Sciences". Master's Degree in Library and Information Science, Iran University of Medical Sciences. 1992.

[33] Adewale, Oduwole Adebambo, and Idowu Adetoun Omolola. "Utilization of library and information and communication technology tools in medical research." *International Journal of Science and Technology Education Research* 3.1. 2012: 1-6.

[34] Kannappanavar, B. U., and H. M. Chidan. "Users perception and opinion towards CAS and SDI services in agricultural science university libraries in India, with special reference to South India: An evaluative study." *International Journal of Library and Information Science* 5.10. 2013: 342-350.

[35] Pao, M. *Concepts of information retrieval*. Mashhad: Ferdowsi University of Mashhad. 1999.

[36] Mousavi Chelek, A. "Suggestion for providing SDI services to MPs". *Baharestan's message*. 2001.

[37] Connor, Judith Holt. "Selective dissemination of information: a review of the literature and the issues." *The Library Quarterly* 37.4. 1967: 373-391.

[38] Bivona, William A., and Edward J. Goldblum. "Selective dissemination of information: Review of selected systems and a design for Army technical libraries". No. IDC-8074. *INFORMATION DYNAMICS CORP READING MA*. 1966.

[39] Hossain, M. Jaber, and Md Shiful Islam. "Selective Dissemination of Information (SDI) service: a conceptual paradigm." *International Journal of Information Science and Management (IJISM)* 6.1. 2012: 27-44.

[40] Jafar Beiglou, M. "Profile structure". *Notices*. 1997.

[41] Wood, M. Sandra, and Robert S. Seeds. "Development of SDI services from a manual current awareness service to SDILINE." *Bulletin of the Medical Library Association* 62.4. 1974: 374.

[42] Resnick, A., and C. B. Hensley. "The use of diary and interview techniques in evaluating a system for disseminating technical information." *American Documentation* 14.2. 1963: 109-116.

[43] Hoshovsky, Alexander G., and C. S. Downie. "Selective Dissemination of Information in Practice. Survey of Operational and Experimental SDI Systems". No. OAR-67-0012. *OFFICE OF AEROSPACE RESEARCH ARLINGTONVA*. 1967.

[44] Kashyap, Radhakrishna. "Selective Dissemination of Information services". *New Dehli: Anmal*. 1998.

[45] Rouhidel, E., N, Riahinia., F, Babalhavaeji., and Z, Abazari. "A survey of knowledge management in principles of acquisition,organization and distribution of information in manuscripts departments in iran by presenting a model". *Journal Management System*. Winter 2015.

[46] Nematollahi, S. "Feasibility study of providing information dissemination services to faculty members of Shiraz University in the Library of Science and Technology by e-mail: providing a suitable model". Master's Degree in Library and Information Science, Iran University of Medical Sciences. 2003.

[47] Amati, Gianni, and Fabio Crestani. "Probabilistic learning for selective dissemination of information." *Information processing & management* 35.5. 1999: 633-654.

[48] Young, H. *The ALA glossary of library and information science* (6th ed.). Chicago, IL: American Library Association. 1983.

[49] Rajabi, A., Gh, R, Shah Mohammadi. "A Method for Using Information Technology in the Knowledge Management of the IRI Police". *Management Studies on Police Training*, 6 (1). 2013: 103-139.

[50] Soltani, P., and R, Farvardin. A cyclopedic dictionary of library and information sciences. 2000.

[51] McAdam, Rodney, and Sandra McCreedy. "A critical review of knowledge management models." *The learning organization* 6.3 1999: 91-101.