Digital Reference Services and Search Engines in S & T Information Environment: An Experience from India

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ABSTRACT: *Traditional libraries have shifted to library automation, electronic resources and digital services. This transition has long time history and going on gradually. Thus modern libraries have become a symbol to highlight the digital counterpart of the traditional libraries. The advancement of digital libraries is not linear process, but it is contribution of many disciplines. In this era, digital libraries have become complex networked systems, which support communication as well as collaboration among different world wide spread communities containing "digital objects" and digital counterpart of printed documents, images, videos, programs, multimedia objects, etc. The libraries having digital resources have emphasis on digital reference service, which is most personalized kind of service, based on one-to-one interaction between library staff and user. The technological support being induced in reference services have been pivotal for digital reference services. The "Digital reference service", known as "Virtual reference service" is being offered to users in modern libraries. The various discussions on the digital reference services, various mechanisms and methods have been strengthening the concept of 'Digital Reference Services' along with the use of search engines and other techniques in libraries such as modes of providing with the focus on use and popularity of digital reference services; and role of search engines that changes the core areas of science and technology libraries. In this context, a case study of Indian Institute of Petroleum (IIP, Dehradun, India) Knowledge Resource Center, library has been presented. The Library has unique collection for special users and to fulfill the information needs of the scientists and researchers in the core area (Petroleum and Refining) of their research felids. Scientists and Researchers using search engines for their scholarly and study work. For this they excessively rely on search engines. The scientists and researchers IIP are aware of various aspects such as the confidentiality and scientific audacity of information accessible on search engines. This IIP knowledge resource center has adopted innovative approaches to enhance the services towards users' requirements by providing specialized resources and services by means of digital reference sources and search engines. This mechanism supports the achievement in the current attentiveness towards their fields.*

Keywords: Digital Reference Service, Digital Library, Virtual Reference Service, Search Engines, IIP

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1. Introduction

Now-a-days, digital libraries have altered the traditional environment for using various effective methods to provide a certain and relevant information to the users. Modern libraries are differing from traditional libraries because they permit clientele to provide an online access to and work with electronic media with the full text Journals or Documents. These digital modern libraries have a variety of systems which does not follow single level of path. According to Smith (2001), "digital library is an organized and focused collection of digital objects, including text, images, audio, video with the methods of access and retrieval and for the selection, creation, organization, maintenance and sharing of collection." Digital modern libraries offer various levels of benefits in terms of accessibility and research. Digital modern library can be visualized as advanced stage of library which is based on high speed optical fiber, to provide access is over LAN, WAN to offer internet-based services. Easily available digital information is worship of internet. All this development gives birth to new range of reference services. in this context, reference service also knows as 'Reference & Information Services' mean "the personalized assistance provided to users in their quest for information." Digital reference service, or the virtual reference service, has a major purpose to provide current or latest, comprehensive or complete, relevant or brief information to their ultimate users when they have any query or issue.

In the current, fast changing electronic environment, user is dependent on only various electronic means such as computer, internet, World Wide Web, G-mails/emails, search engines etc. By meeting such kind of electronic mode, a patron gets easy access to information in a short span of time. To provide quick information services, the libraries provide a help desk during 24*7 though which user can access the digital resources. Such resources and mechanisms fulfill their queries. So, digital reference services are essential part of library in modern era. These services are mainly used in two important sectors:

- For the academic and research purposes

- To outreach to users in digital ages

Thus, the digital reference services and search engines are considered as the tools and mirrors to serve; and reach the users as well as to understand where the library is established.

1.1. Definitions

Some significant definitions of reference services (*in* Mukherjee, 1975; Chandwani, Anita, 2010) are:

According to Foskett, "reference service is essentially humanism in practice, because the aim is to help people, in one way or other, to secure greater happiness through the possession of knowledge".

According to Ranganathan, "reference service is the process of establishing contact between a reader and his document in a personal way".

Few other descriptions of digital reference services include, according to Lankes (*in* Sharma, S. & et al.; 2004), "Digital reference service refer to the position of human intermediated service over digital network". Hence, we can discern that "digital reference service is based upon digital technologies, skills and direct approach between library and user".

2. The Basic Elements of Digital Reference Service

While understanding the depth of digital reference services, it may look into the views expressed by Linda Berube (2003, 2004), that a digital reference service includes the following basic elements as discussed (*in* Chandwani, 2010) such as the user community, the interface; providing the interaction to users and library, to connect with 'electronic resources as well as print resources', and finally, the information service providers.

2.1. Advantages of Digital Reference Services

There are various advantages which are facilitated by information search through computer mediated services. Majority of scientific, technical and scholarly publications are now available electronically and through web-based technology. The digital reference services help common user to locate the required information available electronically; few more are as following:

- User can get the needed information over the own desktop, without moving physically.

· It saves the valuable time of users and ultimately digital reference services helps to implement fourth law of library science.

· Digital reference service provide online and real-time assistance to patrons to search locally available resources as well as forward the request for locating such resources to other partner libraries and return the appropriate assistance to the concerned patrons.

· In traditional reference service there is limitation of time, but digital reference service provides the mechanism for 24/7 online services. Users can send query at any time of their convenience, if the library is in position to facilitate such service then user can be supported round the clock.

· If digital reference service consortium is there, it enhances span of service and helps to provide large size of manpower support as well as varied collections.

2.2. Disadvantages of Digital Reference Services

Apart from the advantages, there are few problematic experiences faced by users, such as:

- Sometime, "face to face interaction" with the user is not possible.
- Library staffs may not be able to clarify all the doubt of patrons regarding the exact requirement.
- Large possibility of technical troubles.
- Fully dependent on technology-based products.
- Speed of service depends on the speed of internet and data system.

3. Modes/Methods of Digital Reference Services

Using modern technologies and effective techniques, there are following digital reference services (Khan, 2015) that are provided to client in modern libraries:

3.1. E-mail based Services: This is a simple and less-costly service that is involving in exchanging the information resources to patrons where patrons send their queries or issue to librarian by using email address. Now-a-days, email based service has become more powerful service by which user can easily get information.

3.2. All Experts: It is free web-based location service where answers are providing by different arenas of subject specialists like engineers, doctors and scientists, etc.

3.3. 'Web Camera Reference Service': In this reference service, librarian and users are talented to interconnect and understand to individually other by using these manners like Skype, Hangout, etc. The discussions with subject-experts, meetings and online rallies can be made accessible for users.

3.4. Chat-based Reference: Chat-based reference service is too mentioned as immediate messaging. It is a real time communication among two or more computer and mobile operators over the internet. It is respected way of message over the internet. It is only text based; e.g. 'whatsapp, wechat, hike' etc. Main advantage of chat reference is that it certificates the patron to stay online while receiving reference help for resolving your queries. The drawbacks include its being appropriate only for one – to one communication, not appropriate for multitasking.

3.5. .Digital Reference Robots: In this kind of reference service, once reference librarian is not available, then artificial intelligence is used to reply the query/question, it is identified as digital robots. Greatest prevalent sample of this reference service is Ask-Jeeves. This service includes usage of software for penetrating the database of question and answers.

3.6. .Library Website-based services: The library web page functions as best interactive portal for the users by providing information about the services as well as linking to vast amount of resources.

3.7. Bulletin Board Service: The BBS is a minor form of an online arrangement for a profitable spreading of information in digital

format, a digital reference service by which the users communicate to subjects reaching specialists.

4. Digital Reference Sources, Services and Search Engines for S&T realm

The augmented roles of digital sources in the form of routine sources and reference sources are evident in the modern libraries. The increased traffic though the search engines, has also been observed in practice and literature. The entire range of digital sources and searching process by the means of search engines has been instrumental to serve the users in libraries. The user behaviour towards the sources subscribed by the libraries and search engines facilitation are few of the significant areas which demand attention from the librarians in order to understand more; the relation, usage and further planning. The present paper has endeavoured to study and discern the close association of various **1.** digital information sources, reference services and search engines in the S&T environment. The libraries are preparing the platforms, interfaces and interactions with users to roll in the sources and services, since the scientific libraries are somehow different in roles and responsibilities so it was a curious attempt to study one of the S&T focused library. For example, the Indian Institute of Petroleum (IIP, Dehradun, India) Knowledge Resource Center, library, present a good example to understand the real environment in context with the resources and services towards the users.

5. The Case of IIP Library and Information Centre: Scope and Method

The following data and analysis present the experiences and visualizations from Indian Institute of Petroleum (IIP, Dehradun, India) Knowledge Resource Center, library, its users, resources and services. The study focused on understanding the use of various digital resources and search engines usage among the users. To collect the data, one questionnaire was designed. Before conducting the final survey among the users, one pilot study was conducted among the users; approximately 30 users from library were served the questionnaire. This pilot study helped in improving the questionnaire including an increased scope of more questions on the sources and tools.

The random sampling method was used to serve the questionnaires. The total number of responses received was 72 out of 100 questionnaires. Out of secluded 28 questionnaires, few of them were incomplete or untimely received, hence not included for data analysis. The various aspects covered in the questionnaire were; the resources preferred, preference of electronic information over print information, features not currently supported in search engines, features expected to have in future search engines, using of resources available on search engines and knowledge portals affect the principle purpose, and privacy and security about the search engines and knowledge portals.

5.1. Resources Preferred

Sources Preferred Options	Option		Option		Option		Option		Total
	Disagree (1)		Partially Agree (2)		Agree(3)		Strongly Agree (4)		
Online Catalogue	0	0.00%	17	23.61%	26	36.11%	29	40.28%	72
Online Reference Services	0	0.00%	3	4.17%	37	51.39%	32	44.44%	72
Online Database	0	0.00%	25	34.72%	40	55.56%	7	9.72%	72
Institutional Repository	0	0.00%	14	19.44%	31	43.06%	27	37.50%	72
Open Access Resources	3	4.17%	23	31.94%	27	37.50%	19	26.39%	72

(Strongly agree = 4; agree = 3 partially agree = 4 disagree = 1)

Table 1. Resources Preferred

The Table 1 shows existing previous studies resource preferred for using the search is the important concern for scientists and researchers of IIP library. The option "Online database" highest percentage is given by users is "Agree", which was followed by "Online Reference Services" "Institutional Repository", and "Open Access Resources" giving the rank separately. The option

"Online Catalogue" was categorized lowermost at fifth place. The data undoubtedly emphasize that the scientists and researchers are preferred source Online Database available on search engines.

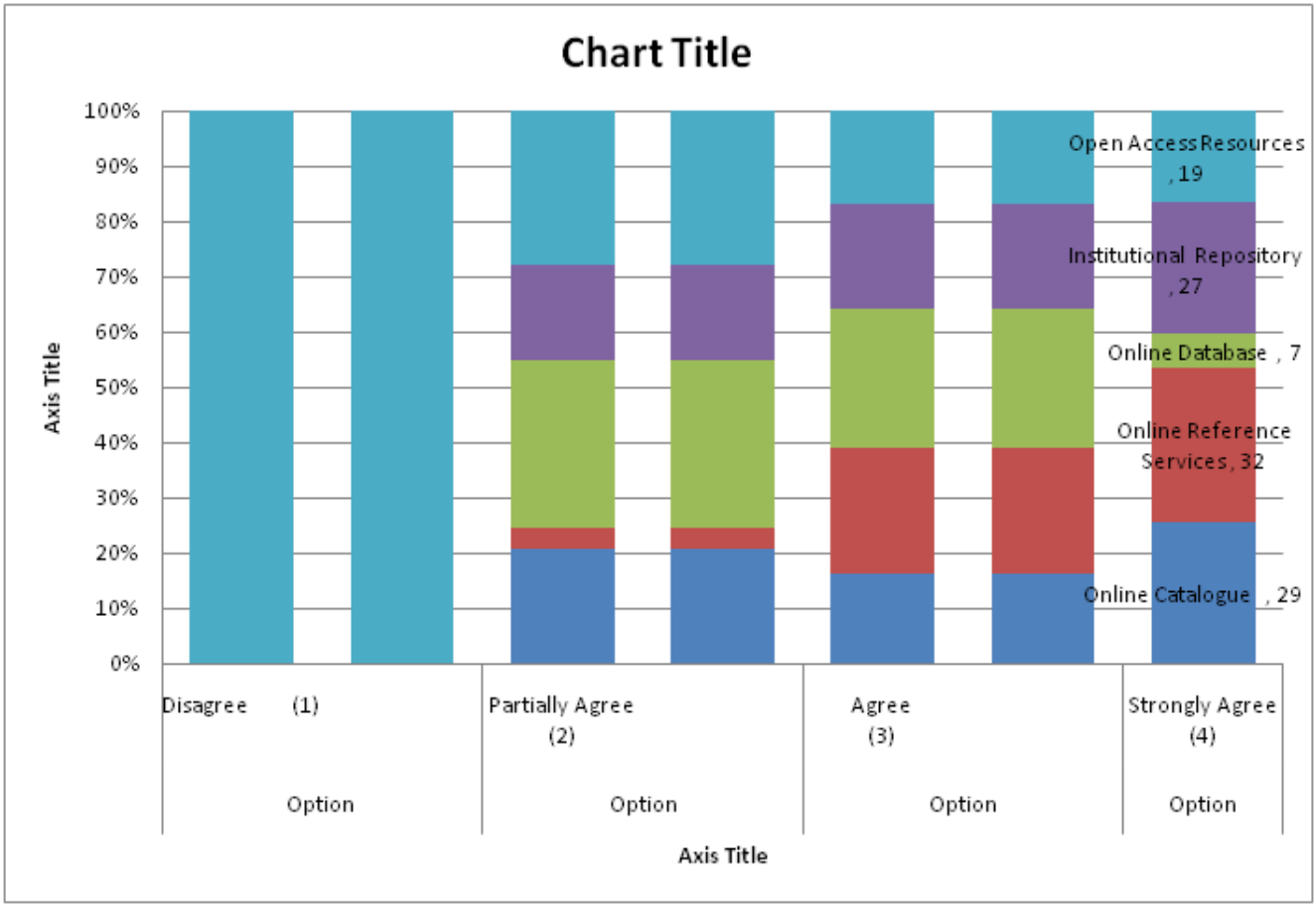


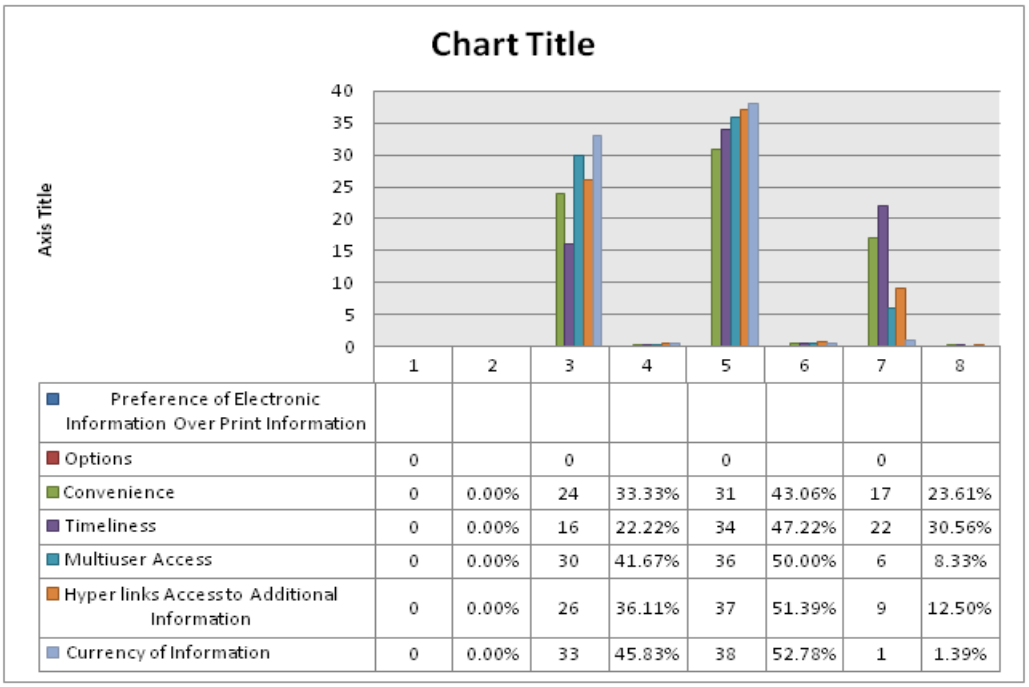
Figure 1

5.2. Preference of Electronic Information Over Print Information

Options	POOR		GOOD		VERY GOOD		EXCELLENT		Total
Convenience	0	0.00%	24	33.33%	31	43.06%	17	23.61%	72
Timeliness	0	0.00%	16	22.22%	34	47.22%	22	30.56%	72
Multiuser Access	0	0.00%	30	41.67%	36	50.00%	6	8.33%	72
Hyper links Access to Additional Information	0	0.00%	26	36.11%	37	51.39%	9	12.50%	72
Currency of Information	0	0.00%	33	45.83%	38	52.78%	1	1.39%	72

(Excellent = 4; very good = 3; good = 2; poor = 1)

Table 2. Preference of Electronic Information over Print Information



Preference of Electronic Information Over Print Information								
Options	0		0		0		0	
Convenience	0	0.00%	24	33.33%	31	43.06%	17	23.61%
Timeliness	0	0.00%	16	22.22%	34	47.22%	22	30.56%
Multiuser Access	0	0.00%	30	41.67%	36	50.00%	6	8.33%
Hyper links Access to Additional Information	0	0.00%	26	36.11%	37	51.39%	9	12.50%
Currency of Information	0	0.00%	33	45.83%	38	52.78%	1	1.39%

Figure 2

The above Table 2 shows "Preference of Electronic Information Over Print Information on Search Engines" by the users of IIP. The option "Currency of Information" mostly users are "Very Good" ranked first, which was followed by "Hyperlinks Access to Additional Information", "Multiuser Access", "Timeliness" and giving the rank respectively. The option "Convenience" was graded last position at fifth place.

5.3. Features Not Currently Supported in Search Engines

Features Not Currently Supported in Search Engines

Options	**Disagree**		**Partially Agree**		**Agree**		**Strongly Agree**		**Total**
Ability to Input One's Own Data Sets	0	0.00%	21	29.17%	29	40.28%	22	30.56%	72
Translation of Materials	0	0.00%	21	29.17%	27	37.50%	24	33.33%	72
Direct Links to Glossary/ Definition	0	0.00%	21	29.17%	25	34.72%	26	36.11%	72
Filtering of Information in Display	2	2.78%	30	41.67%	26	36.11%	14	19.44%	72
Attached Thesauri Package to Aid Searching	5	6.94%	25	34.72%	33	45.83%	9	12.50%	72

(Strongly agree =4; agree =3; partially agree = 2; disagree =1)

Table 3. Features Not Currently Supported in Search Engines

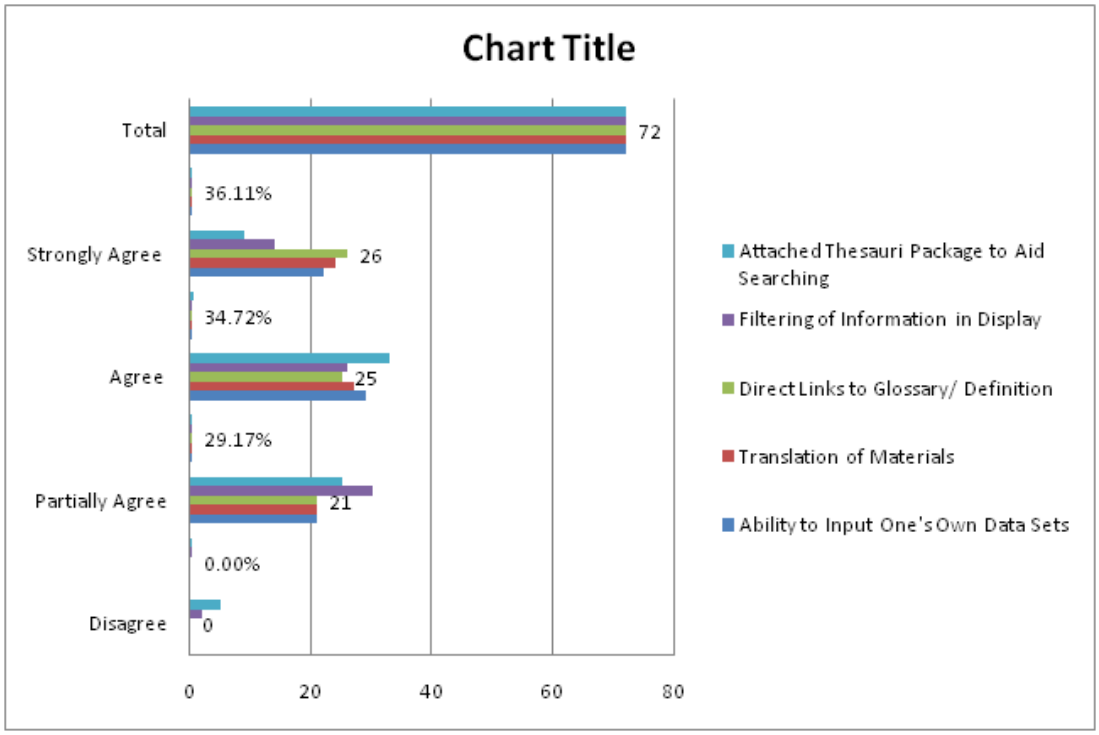


Figure 3

Table 3 has provided that the features not currently supported in Search Engines by the scientists and researchers of IIP. The option "Attached Thesauri Package to Aid Searching" most of the users are "Agree" ranked first mode, which was followed by "Ability to Input One's Own Data Sets", "Translation of Materials, and "Filtering of Information in Display" giving the rank particularly. The option" "Direct Links to Glossary/ Definition was graded last position on fifth position.

5.4. Features do you expect to have in Future Search Engines

Features do You Expect to have in Future Search Engines and Knowledge Portals									
Options	**Disagree**		**Partially Agree**		**Agree**		**Strongly Agree**		**Total**
Searching Capability Across Wide Range of Resources	0	0.00%	10	13.89%	31	43.06%	31	43.06%	72
Direct link to Glossary/Definition	0	0.00%	30	41.67%	28	38.89%	14	19.44%	72
Links to Comments/Annotation by Other Researchers	0	0.00%	12	16.67%	40	55.56%	20	27.78%	72
Display of Relationship/Similarity of Selected Materials	1	1.39%	14	19.44%	33	45.83%	24	33.33%	72
Presentation of CAS/SDI	2	2.78%	21	29.17%	32	44.44%	17	23.61%	72

(Strongly agree =4; agree =3; partially agree = 2; disagree =1)

Table 4. Features do you expect to have in Future Search Engines

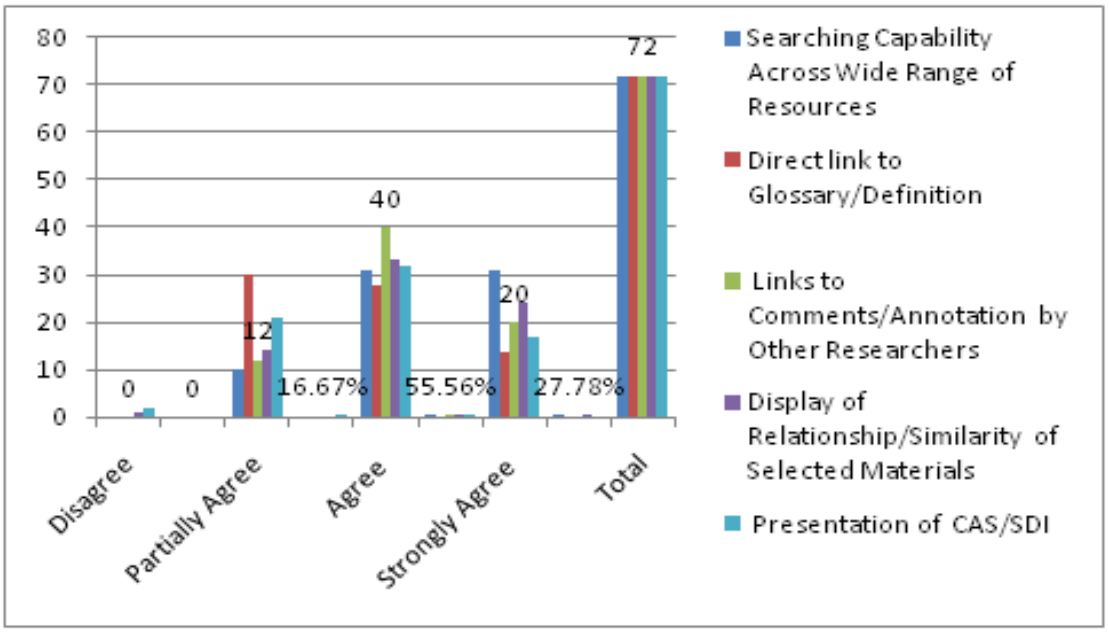


Figure 4

The responses and data in the table 4 reflected that the features expected in future search engines by the scientists and researchers of IIP. The option "Links to Comments/Annotation by Other Researchers", ranked first expected feature mostly users are "Agreed", which was followed by "Display of Relationship/Similarity of Selected Materials", "and "Presentation of CAS/SDI", "Searching Capability Across Wide Range of Resources "giving the rank separately. The option "Direct link to Glossary/Definition" was graded last position on fifth position.

5.5. Using Resources Available through Search Engines and Knowledge Portals Affecting the Principle Purpose

Using Resources Available through Search Engines and Knowledge Portals Affect the Principle Purpose									
Options	**Disagree**		**Partially Agree**		**Agree**		**Strongly Agree**		**Total**
Improves the Results	0	0.00%	6	8.33%	32	44.44%	34	47.22%	72
Narrows/Broadness the Focus			5	6.94%	36	50.00%	31	43.06%	72
Results in Collaborations/Joint Research	2	2.78%	32	44.44%	26	36.11%	12	16.67%	72
Leads You to New Authors/Data Sources	2	2.78%	20	27.78%	31	43.06%	19	26.39%	72
Resolves Technical Problems	0	0.00%	30	41.67%	29	40.28%	13	18.06%	72

(Strongly agree =4; Agree =3; Partially agree = 2; Disagree =1)

Table 5. Using the Resources Available through Search Engines and Knowledge Portals Affecting the Principle Purpose

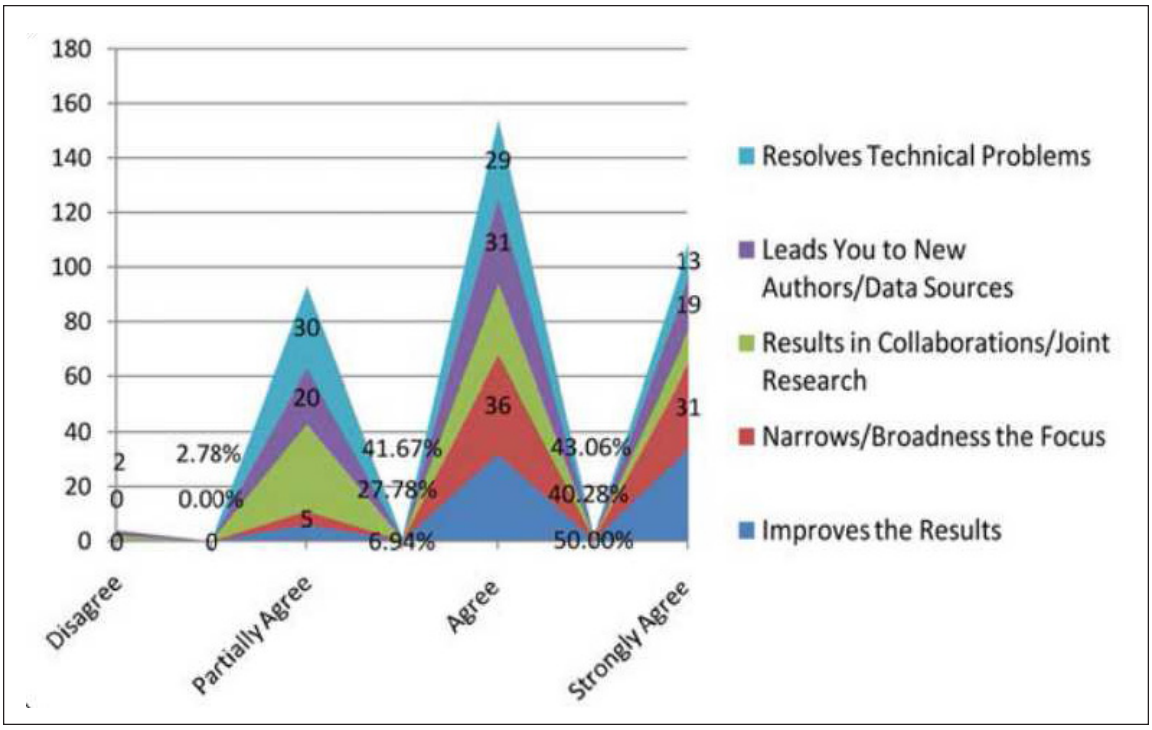


Figure 5

The data and analysis from the table five is about the using of resources available on search engines affect principle purpose of the scientists and researchers of IIP. The option "Narrows/Broadness the Focus" mostly users are "Agree" ranked first purpose, which was followed by "Improves the Results", "Leads You to New Authors/Data Sources", and "Resolves Technical Problems." giving the rank particularly. The option "Results in Collaborations/Joint Research" was graded last position on fifth position.

5.6. Privacy and Security About the Search Engines and Knowledge Portals

Privacy and Security									
	Poor		Good		Very Good		Excellent		Total
Confidentiality for Users Information	5	6.94%	35	48.61%	19	26.39%	13	18.06%	72
Adequacy of Security Features	3	4.17%	41	56.94%	20	27.78%	8	11.11%	72
Reputation of the Portals Company	2	2.78%	30	41.67%	23	31.94%	17	23.61%	72
Proper Use of Personal Information	0	0.00%	28	38.89%	25	34.72%	19	26.39%	72

(Excellent = 4; very good = 3; good = 2; poor = 1)

Table 6. Privacy and Security about the Search Engines and Knowledge Portals

It is observed (table 6) that exposed privacy and security of search engines with the percentage method. This method is used for ranking the most justification for privacy and security about the search engines among the scientists and researchers of IIP. The option "Adequacy of Security features" mostly users are given answers "Good "ranked first, which was followed by "Confiden-

tiality for Users Information", Reputation of the Portals Company" and "Proper Use of Personal Information," and at giving the position independently. The positively precise that the scientists and researchers are using search engines for privacy and security on Search Engines.

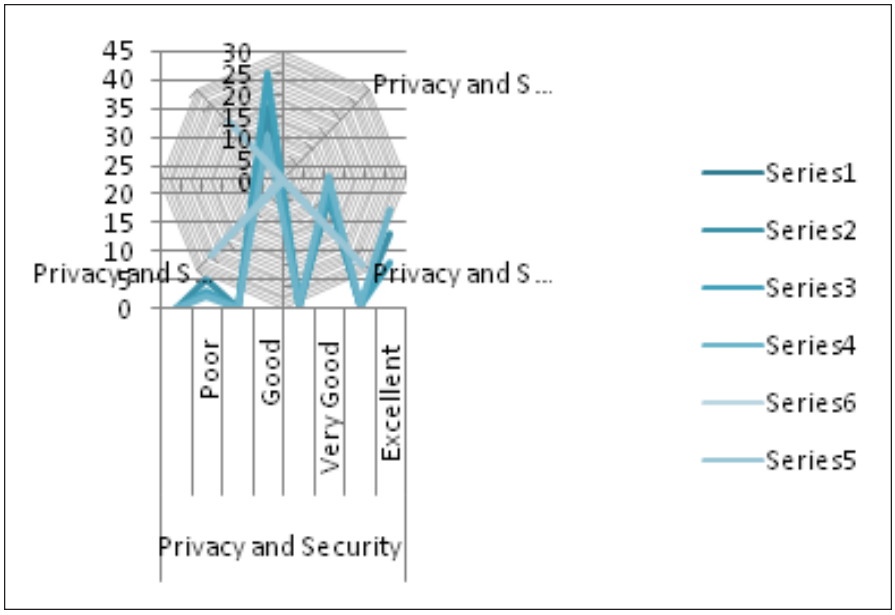


Figure 6

6. Discussion

The study brings out few significant aspects into the knowledge such as the kind of resources being used, preferred and demanded. This would help in framing the policies for collection building, resources availability and service designing. It is found that the online database, followed by "Online Reference Services", "Institutional Repository", and "Open Access Resources" are popular among the scientists. The scientists and researchers prefer the Online Database. The users prefer electronic information over print information on search engines due to "Currency of Information" and other factors such as hyperlinks, access to additional information", multiuser access, and timeliness. Various features of digital sources and search engines compel the scientists to popularize these platforms. The features such as "Attached Thesauri Package to Aid Searching", followed by "Ability to Input One's Own Data Sets", "Translation of Materials, and "Filtering of Information in Display" are the reasons among the users for using these resources. Various features functioned for the augmented usage among the scientists; these features have been identified as "Links to Comments/Annotation by Other Researchers" (ranked first expected feature), followed by "Display of Relationship/Similarity of Selected Materials", "and "Presentation of CAS/SDI". The "searching capability across wide range of resources" has also been found very impressive among the scientists. The options "Narrows/Broadness the Focus", followed by "Improves the Results" are most influential for using of resources available on search engines affect principle purpose of the scientists and researchers of IIP. It was found that "Adequacy of Security features", followed by "Confidentiality for Users Information" are the strongest reasons about the privacy and security about the search engines among the scientists and researchers of IIP.

7. Recommendation and Suggestions

In a modern library, the major role of librarians is working with 'digital reference services (DRS)' need training for providing efficient services. Librarians not only depend on theoretically or old technique. They must be needed regular, similar training and workshops to be skilled in an online environment. Digital reference service should be well promoted within the users of the organization/institution. It is found that although web-based services are available, the use of search engines is significant to reach to the intended sources of information. The authentic sources of information such as databases are popular among scientists. The option of open access sources has also been found in niche, the direction of such e-resources can also be explored. library staff should be providing personal touch of subject experts to the ultimate users.

7. Conclusion

Though 'Digital Reference Services' (DRS) and search engines are being used in modern libraries, yet the more aggressive approach is required in libraries. The implementation of newly designed services is must to provide an interactive approach to users towards the highly expensive databases and other resources of libraries. The efforts in the form of user orientation, workshops can be fruitful to engage the specific communities such as scientists in libraries. The role of library staff is always there to play a crucial role and definitely, they are instrumental in the science and technology libraries. It is one of the major modern services of libraries but still its implementation is not so prevalent in India. Library Society and Associations should make appropriate effort to provide training and professional courses to our library staffs. So, librarian should conduct more seminars, conference and in-house training for the purpose of increase the library staff skills and abilities. In this paper, the very essential and important for all modern libraries because it's made library paper-less and less manual efforts.

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