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Perception and Use of Semantic and Social Features of Digital Libraries among Library and Information Professionals and Users: A Comparative Study

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Abstract

The paper identifies perception and use of Semantic and Social Features of the digital library among library and Information professionals (LISPs) and Users and presents a comparative study of their competencies in tune with the semantic and social features. As part of the survey of the special libraries in NCR of Delhi, the questionnaires and personal visit were made to 48 libraries (spread over 16 categories) to collect the primary data. The requisite data of 48 special libraries, were collected, collated and analyzed accordingly. The study has made clear that library and information professionals and users of digital libraries in SLICs have a fair knowledge and understanding of semantic and social solutions of the digital libraries. There are a lot of semantic and social features available in the digital libraries and there is an urgent need to increase its familiarity and use among LISPs and users both. The study hopefully has given to an understanding the semantic solutions for the digital libraries based on semantic web technologies and results of the study can be accepted as a pointer for further experiment and training to improve these features of DLs to a new height.

Keywords – Semantic Web, Semantic Digital Library, Digital Library, Social Semantic Digital Library

1. Introduction

Digital library concept has been changing since 'Memex'. Current generations of digital libraries are capable to address efficient information discovery solutions to end-users. Recently Semantic and social technologies deployed in practice to the digital libraries domain by supporting interoperability with formal semantics, improving interlinking of information and encouraging users to contribute and share knowledge (Kruk, 2010). Kruk considers:

"semantic digital library as a system that integrates knowledge organization systems, delivered by classic digital libraries, with the semantic web and social networking (Web 2.0) technologies. Semantic Web technologies support the expressiveness of annotations and interoperability with other services (not only digital libraries). The Web 2.0 approach allows users to be engaged in the annotation and knowledge sharing process, making semantic digital libraries more useable"(Kruk, 2010).

The research on semantic digital libraries can be seen from two perspectives, firstly, the deployment of semantic technologies to improve information discovery with services exploiting semantic and collaborative knowledge sharing, and second, integration of social services which provides benefits of social media to share, review, collaborate, and recommend, etc. Integrating these two services improve knowledge discovery and sharing in a digital library. Advanced digital library systems incorporate the power of semantic services and social networking technologies and establish synergy between digital libraries, the Semantic Web, and social networking technologies.

A couple of digital library software (commercial, open-source, free) is available for the librarians to build, maintain, organize, and make their collections available over the Internet for end-users in terms of digital libraries and institutional repositories. These Digital Libraries and Institutional repositories are very often being offered free of cost to its target users community. In spite of this, these facilities find it hard to use by its end users. The reasons may be that the library and information centers do not promote this service or they are neither aware of recent developments of digital library domain as semantic technology became increasingly popular nor the users of the digital library are willing to use the services as they do not get what they expect from their digital libraries and institutional repositories. It is, therefore, important to find out the awareness of semantic and social solutions for the digital libraries among library and

information professionals (LISPs) and Users of the digital Libraries. This study is a step taken in this direction.

2. Definition of terms

For the purpose of this study, the following terms have been used to mean what they are defined as follows:

Terms	Definition
Collaborative Browsing	Collaborative browsing is a browsing method that enables the simultaneous viewing of a specific Web resource by more than one individual, facilitating remote and/or real-time access or work
Digital Library(DL)	A digital library is an organized and focused collection of digital objects, including text, images, video, and audio, along with methods for access and retrieval, and for selection, creation, organization, maintenance, and sharing of the collection
Folksonomy	A folksonomy is a system of classification derived from the practice and method of collaboratively creating and translating tags to annotate and categorize the content.
Knowledge Organization Systems(KOS)	Knowledge Organization Systems (or KOS) is a generic term used in Knowledge organization about authority lists, classification systems, thesauri, topic maps, ontologies, etc.
Linked data	Linked data is a term used to describe a recommended best practice for exposing, sharing, and connecting pieces of data, information, and knowledge on the Semantic Web using URIs and RDF.
Metadata	Metadata is descriptive information about the elements of a set of data, e.g. the information contained in a webpage which describes the topics covered by that webpage.
Ontology	An ontology is a formal, explicit specification of shared conceptualization a domain of interest.
Search Engine(SE)	Search Engine is software that carries out a search of a database when a user asks it to find information. On the Internet, there are many search engines that list all the websites and allow a user to find a website by searching for particular information.
Semantic	The semantics of something is the meaning of something.
Semantic Digital Library(SDL)	Semantic Digital Library(SDL) integrates information based on different metadata, e.g.: resources, user profiles, bookmarks, taxonomies, provides interoperability as well as delivering more robust, user-friendly and adaptable search and browsing interfaces empowered by semantics.
Semantic Web(SW)	The semantic web can be defined as a meaningful web where some kinds of meaning or context attached to the information. The idea behind the semantic web is to develop such technologies that make the web more meaningful.
Social bookmarking	Social bookmarking is personalised metadata added to recommend web resources by users, as a 'bookmark' to help others in the field to find it.
Social media	Social media is the interaction among people in which they create, share or exchange information and ideas in virtual communities and networks
Social Semantic Digital Library(SSDL)	Social Semantic Digital Library (SSDL) is basically an outcome of the synergy between digital libraries, the Semantic Web, and social networking with an aim to improve, among other things, the usability of information discovery.
Semantic Tagging	Semantic Tagging is the process of associating an element from an ontology with some document, usually a computer file or website.
Semantic Search	Semantic search seeks to improve search accuracy by understanding the searcher's intent and the contextual meaning of terms as they appear in the searchable dataspace, whether on the Web or within a closed system, to generate more relevant results.

3. Research questions and methodology

Two separate questionnaires were structured, each one for LISPs and Users of the SLICs. We have made in an effort here to compare the elicited responses of section 'awareness of semantic and social feature in the digital library' from both the categories in the tubular form to arrive at an accurate generalization.

The key research questions of the study were:

RQ1: What is the experience of LISPs and Users about the task of registering to the digital library systems.

RQ2: What is the expertise of LISPs and Users about different features in the digital library

RQ3: What is their perception about the usefulness of semantic features of a digital library

RQ4: What is their opinion about semantic solutions in order to meet their information needs.

In order to find out the answer of the research questions, a systematic methodology is being adopted which is discussed as under:

I. Sample Design

A sample design is a definite plan for obtaining a sample from a given population. It refers to the technique or the procedure the researcher would adopt in selecting items for the sample. The sample design for the present study was purposive random sampling. In the proposed study 48 special libraries (spread over 16 categories) which have a long existence and well established were selected for the purpose of sampling.

II. Research population

The population of the present study includes the Special Library and Information Centers of the 16 categories X 3 =48.

III. Sample size

The sample size for the present study is as follows:

  i.   Special Library and Information Centers   : 48
  ii. Library and Information Professionals(LISPs)   : 85

iii.   Library Users(LU)   : 134

As discussed above, two different categories LISPs and User were included in the investigation. In many cases, the users were not interested to respond to the questions because of the paucity of time or want to avoid the ambiguity or reluctant to answer and questions of technical nature. Personal visits were made to the concerned special libraries and information centers of NCR, Delhi to collect the first-hand data to fill up the questionnaires.

Table No. 1: Configuration of Target Population

Sl. No.	Types of Special Libraries	LISPs			Users			Total		
		No. of Responses	% of Rows	% of T of Column	No. of Responses	% of T of Rows	% of T of Column	TR of Rows	% of Rows	% of the column of the Total
1.	Health	6	60.0	7.1	4	40.0	3.0	10	100.0	4.6
2.	NGOs	3	33.3	3.5	6	66.7	4.5	9	100.0	4.1
3.	Music &Culture	5	41.7	5.9	7	58.3	5.2	12	100.0	5.5
4.	Law	6	40.0	7.1	9	60.0	6.7	15	100.0	6.8
5.	Management	4	20.0	4.7	16	80.0	11.9	20	100.0	9.1
6.	Economics and Social Sciences	8	36.4	9.4	14	63.6	10.4	22	100.0	10.0
7.	Defense	5	41.7	5.9	7	58.3	5.2	12	100.0	5.5
8.	Corporate	5	50.0	5.9	5	50.0	3.7	10	100.0	4.6
9.	News Paper and Media	3	23.1	3.5	10	76.9	7.5	13	100.0	5.9
10.	International Org.	4	44.4	4.7	5	55.6	3.7	9	100.0	4.1
11.	Science and Technology	6	40.0	7.1	9	60.0	6.7	15	100.0	6.8
12.	Govt./Autonomous	6	37.5	7.1	10	62.5	7.5	16	100.0	7.3
13.	Agriculture	8	44.4	9.4	10	55.6	7.5	18	100.0	8.2
14.	Education	5	29.4	5.9	12	70.6	9.0	17	100.0	7.8
15.	Maps, Design& Archive	6	42.9	7.1	8	57.1	6.0	14	100.0	6.4
16	Legislative Library	5	71.4	5.9	2	28.6	1.5	7	100.0	3.2
	Total	**85**		**100.0**	**134**		**100.0**	**219**		**100.0**

V. Response Rate

Two separate sets of questionnaires were structured and were used to collect data. One questionnaire for LISPs survey and another for Users survey. A total of 144 questionnaires were distributed randomly to LISPs and 192 questionnaire distributed to Users by hand and mail through Google online survey. While a few refused to receive the questionnaire, even after repeated attempts, the researcher could not meet some of the respondents in some SLICs due to vast geographical and fiscal constraints.

Out of the total questionnaires distributed, 85 questionnaires duly filled in by LISP were received (59.02%) and 134 questionnaires duly filled in by users of SLICs were received (69.79%) with the satisfactory response rate.

4. Key Findings

4.1 Task of Registering to the Digital Library

Table 2 presented the respondents towards the task of registering to the digital library by the LISPs and users of SLICs.

Table 2- Task of Registering to the Digital Library

Sl. No.	Experience	Response	
		LISPs	Users
1.	Hard to Understand	6(4.5%)	3(3.5%)
2.	Easy to Understand	61(45.5%)	49(57.6%)
3.	Very Hard to Understand	2(1.5%)	4(4.7%)
4.	Very Easy to Understand	21(15.7%)	23(27.1%)
5.	Not Familiar	45(33.6)	6(7.1%)
	Total	85	134

Table 2 clearly unfolds that, a majority of 57.6% LISPs are considered the task of registering to the digital library 'Easy to Understand' followed by 27.1% 'Very Easy to Understand' and 7.1% LISPs are not at all familiar with the task which is not so significant. Resultant data interestingly unearths the fact that most of the digital libraries included in the survey are designed in such a way of making the task of registering to digital libraries easier. Further, results revealed that 61 users (45.5%) are found the task of registering to the digital library is 'Easy to Understand' followed by 21(15.7%) is 'Very Easy to Understand' whereas 'Hard to Understand' and 'Very Hard to Understand' opinion given by 4.5% respectively. Out of the total 134 responses, 45(33.6%) of users are not familiar with the task of registering to the digital libraries.
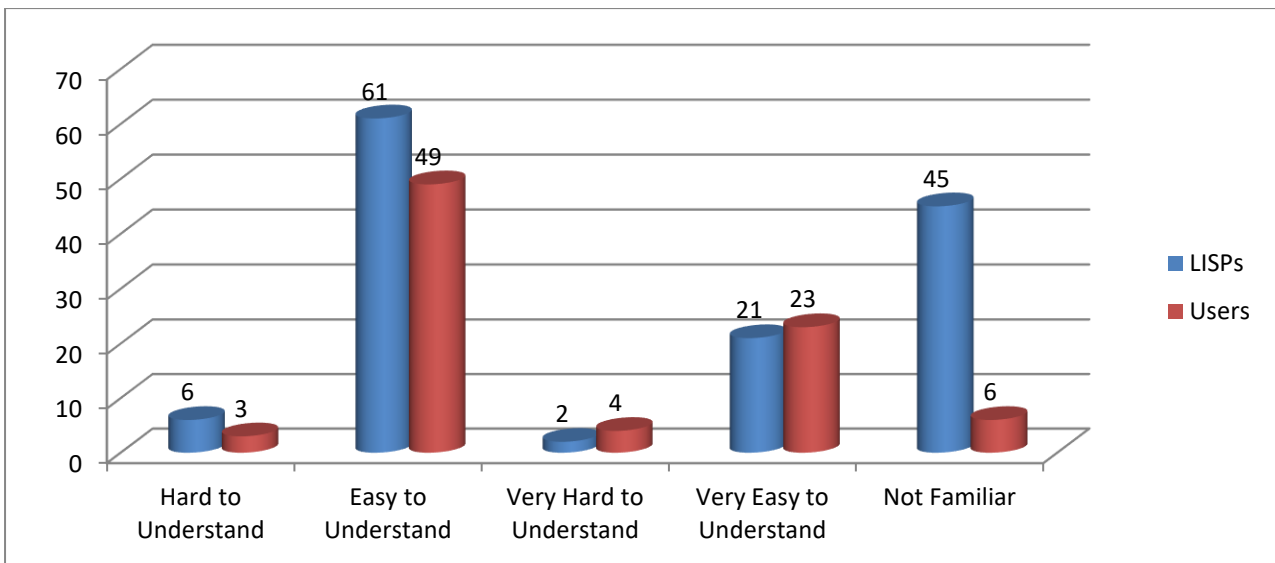
Figure 1: Task of Registering to the Digital Library

The results presented in table 2 concluded that most of the digital libraries are designed and developed in such a way that registering to DL is very easy task both by users and LISPs.

4.2. The expertise of features in the Digital Library

Table 3 shows the level of expertise of the respondents (LISPs& Users) on various semantic and social features in the digital library. Results indicate that LISPs have very good expertise in Bookmarking (50.6%) and RSS Feed (43.5%) features, while their level of expertise on features such as Semantic Tagging (44.7%) and Collaborative Browsing (36.5%) remained at a much lower level, hence not so encouraging.

Table 3: Expertise of feature in Digital Library

Sl. No.	Features	Very Good		Good		Medium		Bad		Very Bad	
		LISPs (%)	Users (%)	LISPs (%)	Users (%)	LISPs (%)	Users (%)	LISPs (%)	Users (%)	LISPs (%)	Users (%)
1	Customizable theme	25 (29.4)	15 (11.2)	22 (25.9)	19 (14.2)	10 (11.8)	13 (9.7)	0 (0.0)	23 (17.2)	28 (32.9)	64 (47.8)
2	Interactive Features	27 (31.8)	20 (14.9)	23 (27.1)	13 (9.70)	11 (12.9)	20 (14.9)	2 (2.4)	29 (21.6)	22 (25.9)	52 (38.8)
3	Customizable Contrast	31 (36.5)	21 (15.7)	21 (24.7)	23 (17.2)	18 (21.2)	38 (28.4)	8 (9.4)	20 (14.9)	7 (8.2)	32 (23.9)
4	Visibility of list of friends	8 (9.4)	11 (8.2)	15 (17.6)	25 (18.7)	6 (7.1)	26 (19.4)	19 (22.4)	25 (18.7)	37 (43.5)	47 (35.10
5	Bookmarking	43 (50.6)	52 (38.8)	9 (10.6)	28 (20.9)	3 (3.5)	13 (9.7)	0 (0.0)	16 (11.9)	30 (35.3)	25 (18.7)
6	RSS Feed	37 (43.5)	48 (35.8)	25 (24.9)	31 (23.1)	6 (7.1)	7 (5.2)	3 (3.5)	23 (17.2)	15 (17.6)	25 (18.7)
7	Semantic Tagging	2	2	16	16	25	25	38	38	4	53

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#	Feature										
		(2.4)	(1.5)	(18.8)	(11.9)	(29.4)	(18.7)	(44.7)	(28.4)	(4.7)	(39.6)
8	Semantic Search	20 (23.5)	18 (13.4)	24 (28.2)	24 (17.9)	8 (9.4)	8 (6.0)	3 (3.5)	31 (23.1)	30 (35.3)	53 (39.6)
9	Ranking and Tag Filtering	10 (11.8)	10 (7.5)	16 (18.8)	16 (11.9)	17 (20.0)	17 (12.7)	21 (24.7)	21 (15.7)	21 (24.7)	70 (52.2)
10	Collaborative Browsing	1 (1.2)	1 (0.7)	5 (5.9)	5 (3.7)	46 (54.1)	9 (6.7)	31 (36.5)	37 (27.6)	2 (2.4)	82 (61.2)
11	Rating Features	42 (49.4)	49 (36.6)	6 (7.1)	26 (19.4)	2 (2.4)	17 (12.7)	1 (1.2)	18 (13.4)	34 (40.0)	24 (17.9)
	Total	**246**	**246**	**182**	**226**	**152**	**193**	**126**	**281**	**230**	**527**

It is also evident from the above table 3 that, 43.5% of LISPs have very bad expertise in Visibility of list of friends features available in most of the modern days' digital library software. This may be due to the fact that the concept is very much new and recently came into existence in digital library domain with the emergence of the concept of FOAF (an acronym of Friend of a friend).
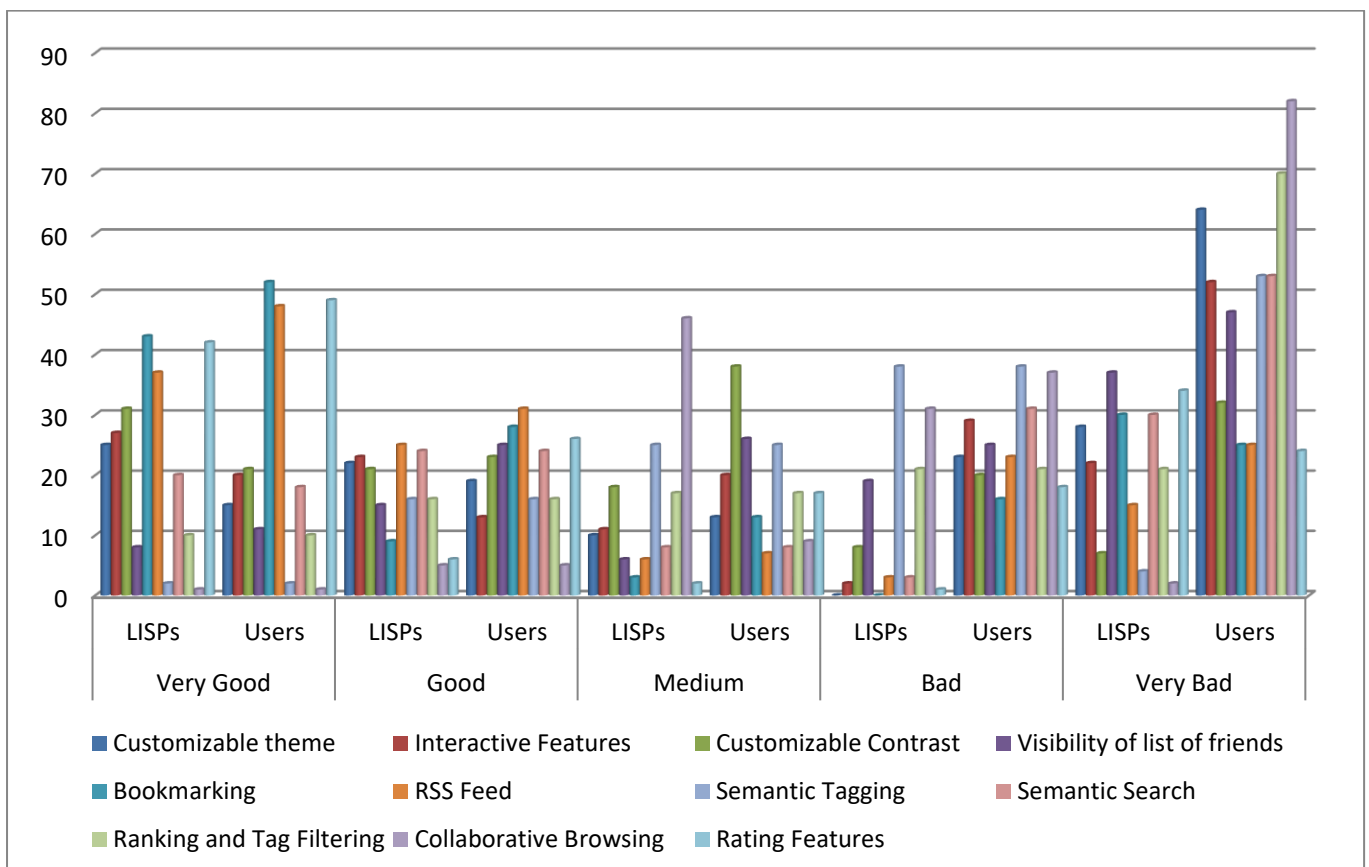

Figure.2. The expertise of feature in Digital Library

Results also indicate that users have very good expertise in Bookmarking (38.8%) and RSS Feed(35.8%) and rating features(36.6%) whereas users have very bad expertise for the features such as Collaborative Browsing(61.2%) and Ranking and Tag Filtering (52.2%). It can be also drawn results

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from the above table 3 that 43.5% of users have a very mixed response from various features such as bookmarking 38.8% very good, 20.9% good, 9.7% medium, 11.9% bad, 18.8% very bad expertise. Similarly, there is a mixed opinion of the users for the features like Customizable Contrast and Interactive Features. Hence, the results presented in table 3 concluded that there is mixed of response from users and LISPs both on the level of expertise of various semantic and social features in the digital library.

4.3 Usefulness of Semantic Features

Table 4 makes a clear depiction of the responses of the LISPs on how useful is the semantic tools/features for the digital library. The result shows that, for the features like Simple Search(72.9%), Advanced Search (63.5%), Semantic Search (69.4%), RSS feeds (45.9%) and Bookmarking (62.4%), professionals have given their opinion under 'very useful' category.

Table 4: Usefulness of Semantic Features

Sl. No.	Features	Very Useful		Useful		Not Useful		Don't Know	
		LISPs (%)	Users (%)	LISPs (%)	Users (%)	LISPs (%)	Users (%)	LISPs (%)	Users (%)
1	Simple Search	62 (72.9)	62 (46.3)	20 (25.3)	57 (42.5)	1 (1.2)	0 (0.0)	2 (2.4)	15 (11.2)
2	Advanced Search	54 (63.5)	54 (40.3)	28 (32.9)	50 (37.3)	1 (1.2)	2 (1.5)	2 (2.4)	28 (20.9)
3	Semantic Search	59 (69.4)	33 (24.6)	18 (21.2)	46 (34.3)	1 (1.2)	2 (1.5)	7 (8.2)	53 (39.6)
4	Semantic Browsing	29 (34.1)	17 (12.7)	24 (28.2)	24 (17.9)	1 (1.2)	1 (0.7)	31 (36.5)	92 (68.7)
5	Recommendation	20 (23.5)	20 (14.9)	29 (34.1)	23 (17.2)	3 (3.5)	3 (2.2)	33 (38.8)	88 (65.7)
6	RSS feeds	39 (45.9)	54 (40.3)	34 (40.0)	44 (32.8)	3 (3.5)	3 (2.2)	9 (10.6)	33 (24.6)
7	Taxonomy View	21 (24.7)	15 (11.2)	29 (34.1)	23 (17.2)	1 (1.2)	3 (2.2)	34 (40.0)	93 (69.4)
8	Semantic Tagging	19 (22.4)	27 (20.1)	36 (32.4)	38 (28.4)	2 (2.4)	2 (1.5)	28 (32.9)	67 (50.0)
9	Bookmarking	53 (62.4)	73 (54.5)	19 (22.4)	42 (31.3)	1 (1.2)	1 (0.7)	12 (14.1)	18 (13.4)
10	Tag Filtering	17 (20.0)	7 (5.2)	27 (31.8)	35 (26.1)	2 (2.4)	3 (2.2)	39 (45.9)	89 (66.4)
11	RDF Query	12 (14.1)	7 (5.2)	18 (21.2)	21 (15.7)	2 (2.4)	4 (3.0)	53 (62.4)	102 (76.1)
	Total	**385**	**369**	**282**	**403**	**18**	**24**	**250**	**678**

It is also evident from the Table 4 that, 62.4 % professionals for RDF Query, 45.9% for Tag Filtering, 40% for Taxonomy View, 38.8% Recommendation and 36.5% for Semantic Browsing, however,

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expressed their ignorance about the utilitarian value of these features as they do not know that how useful are these features in the digital library for them. Table 4 also shows perceptions of the users about the usefulness of semantic tools/features for the digital library. The results clearly indicate that 62 users (46.3%) opined that simple search is very useful to them followed by 57 users (42.5%) feel that simple search is useful to them whereas 15 users (11.2%) do not know that how useful is simple search features for them. Similarly for the features such as Advanced Search (40.3%), RSS feeds (40.3%) and semantic search (24.6%) users opined that these features are very useful to them whereas 102 users (76.1%) do not know RDF query features followed by Taxonomy View(69.4%), semantic browsing(68.7%)and tag filtering (66.4%) especially available in semantic digital libraries.
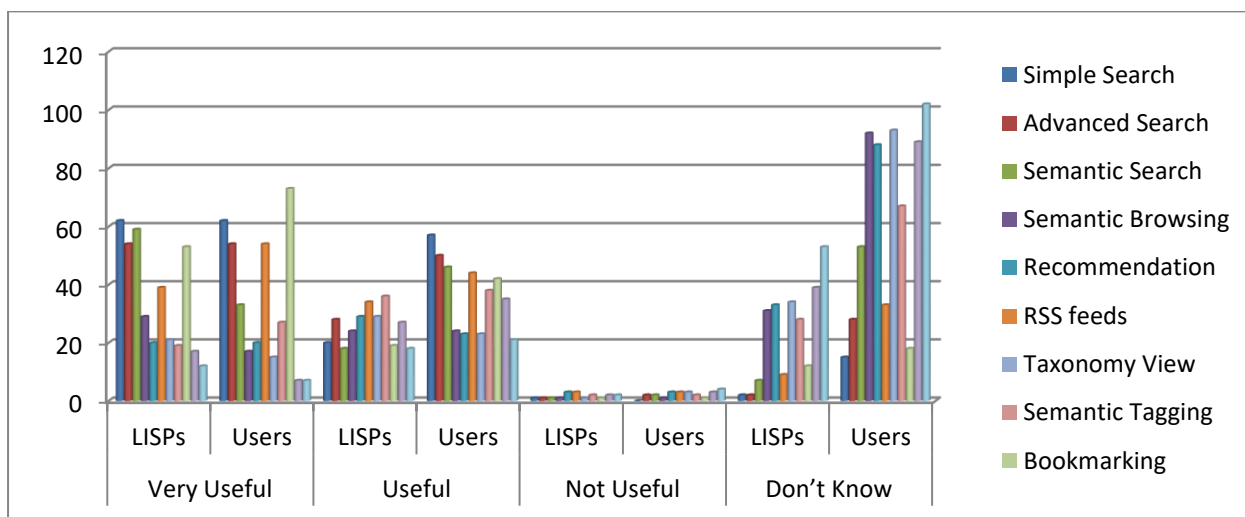

Figure.3. The usefulness of Semantic Features

One can, therefore, safely infer from such balanced and mixed kit of responses that, the respondents seem to have acquired their expertise only on a set of specific features as they ask only in few select domains of the DL. Hence, neither all the LISPs are fully expertise nor completely unfamiliar with all the semantic features of DLs. The same is reciprocated in the case of users.

4.4. Semantic Solutions for DL's: Statement Judgments

Table 5 shows the responses of LISPs and Users of SLICs on how semantic solutions for the digital libraries is based on semantic web technologies integrated with social features that help library and information professionals and users. In formation elicited from the respondents under eight statements

using five variables are consolidated and depicted in the following table for necessary statistical analysis and interpretation.

Table 5: Statement Judgments

Sl. No.	Statement	Strongly Agree		Agree		Disagree		Strongly Disagree		No Idea	
		LISPs (%)	Users (%)	LISPs (%)	Users (%)	LISPs (%)	Users (%)	LISPs (%)	Users (%)	LISPs (%)	Users (%)
1	IVID[1]	49 (57.6)	38 (28.4)	34 (40.0)	62 (46.3)	1 (1.2)	1 (0.7)	0 (0.0)	1 (0.7)	1 (1.2)	32 (23.9)
2	FIME[2]	51 (60.0)	91 (67.9)	31 (36.5)	35 (26.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (3.5)	8 (6.0)
3	URMI[3]	38 (44.7)	28 (20.9)	27 (31.8)	24 (17.9)	2 (2.4)	9 (6.7)	0 (0.0)	5 (3.7)	18 (21.2)	68 (50.7)
4	OCKS[4]	31 (36.5)	43 (32.1)	33 (38.8)	37 (27.6)	2 (2.4)	2 (1.5)	0 (0.0)	1 (0.7)	19 (22.4)	51 (38.1)
5	PIOS[5]	20 (23.5)	15 (11.2)	33 (38.8)	21 (15.7)	0 (0.0)	3 (2.2)	0 (0.0)	3 (2.2)	32 (37.6)	92 (68.7)
6	EPEC[6]	17 (20.0)	33 (24.6)	38 (44.7)	43 (32.1)	3 (3.5)	3 (2.2)	0 (0.0)	1 (0.7)	27 (31.8)	54 (40.3)
7	DRUF[7]	31 (36.5)	64 (47.8)	42 (49.4)	42 (31.3)	1 (1.2)	1 (0.7)	0 (0.0)	0 (0.0)	11 (12.9)	27 (20.1)
8	KOSS[8]	36 (42.4)	26 (19.4)	34 (40.0)	44 (32.8)	0 (0.0)	1 (0.7)	0 (0.0)	1 (0.7)	15 (17.6)	62 (46.3)
	Total	**273**	**338**	**272**	**308**	**9**	**20**	**0**	**12**	**126**	**394**

Notes: **1.** Improve visibility and information discovery; **2.** Enable users to find information more easily; **3.** Enable users to retain more information; **4.** Offers collaborative knowledge sharing; 5**.** Provide interoperability with other systems; **6.** Enhance peer communication; **7.** Deliver more robust, user-friendly and adaptable search and browsing; **8.** Integrate knowledge organization system, semantic web, and social networking technologies.

Table 5 clearly reveals that there is an inclination of the library and information professionals towards semantic solutions for the digital library. It is quite evident that around 57.6 % of respondents "strongly agree" and 40.0% only "agree" with the statement that semantic solutions for the digital library can improve visibility and information discovery; followed by 60.0 % "strongly agree" and 35.5% only "agree" with semantic solutions for the digital library enables users to find information more easily. It is quite surprising to note that, 37.6 % LISPs have 'no idea' that semantic solutions for the digital library can enhance peer communication; followed by 31.8% has no idea that semantic solutions can deliver more robust, user-friendly and adaptable search and browsing; although they have been using semantic features in the digital libraries quite for some time.
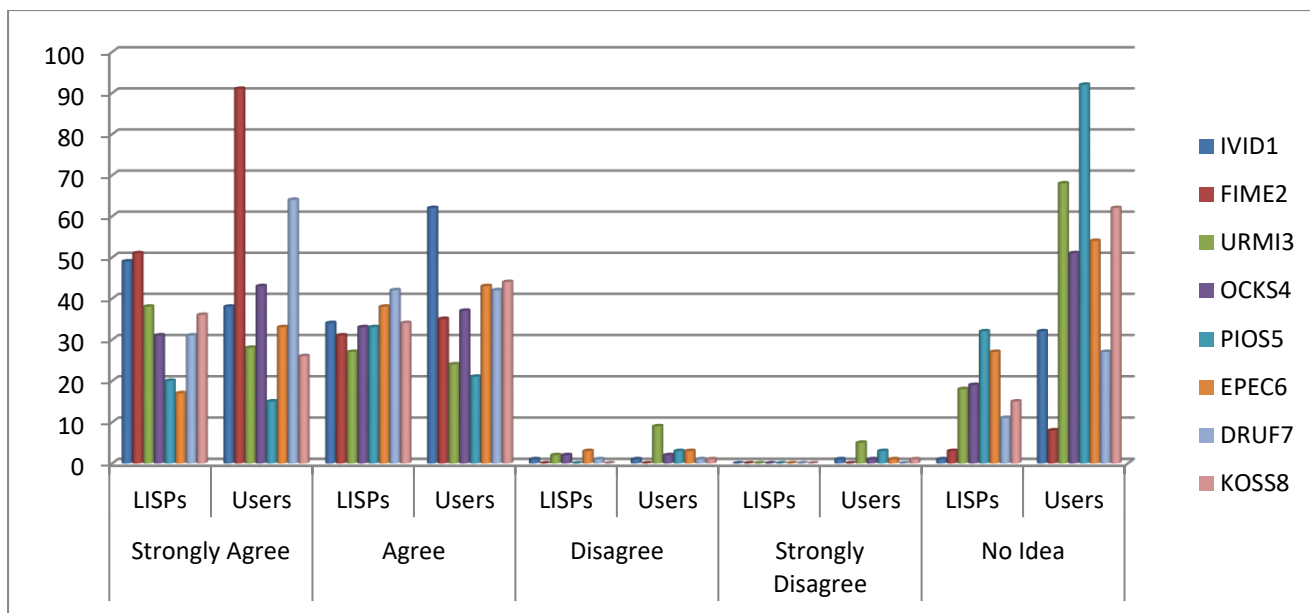
Figure.3. The usefulness of Semantic Features

Results indicate 67.9 % users are "strongly agree" and 26.1% are only "agree" with the statement that semantic solutions for the digital library Improve enable users to find information more easily followed by 47.8 % users are "strongly agree" and 31.3% only "agree" with the statement that semantic solutions for the digital library deliver more robust, user friendly and adaptable search and browsing.

The result of table 5 also indicates that 68.7 % of users have no idea that semantic solutions for digital libraries provide interoperability with other systems. This is maybe due to none awareness of technical term interoperability.

5 Conclusion

The study explored to find out answers on the functionality and usefulness of several features that are helpful for improving the usability of information discovery in digital libraries by introducing semantic and social features, providing advanced information discovery services, and supporting knowledge sharing by LISPs and users of SLICs. The study has made clear that library and information professionals and users of the special libraries and information centers have a fair knowledge of semantic and social features of a digital library. The resultant data further pointed out that, how semantic solutions for the digital libraries is based on semantic web technologies integrated with social features that help library and information professionals and users in a significant way.

There are a lot of semantic and social features available in the digital libraries and there is an urgent need to increase its familiarity and use among library and Information professionals and users of the SLICs.

Notes

The definition of terms have been taken from the following sources:

i. https://www.techopedia.com/definition/14036/collaborative-browsing.
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