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Measuring Information Literacy Core Competency of Social Science Researchers in National Capital Region, India

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Measuring Information Literacy Core Competency of Social Science Researchers in National Capital Region, India

Introduction

With the availability of more and more information in e-format, particularly on the web, academics and researchers need additional skills and knowledge to identify, locate, evaluate, use and communicate the information effectively and efficiently. The term 'Information Literacy' (IL) broadly refers to a set of skills and understanding that enables an information literate individual to successfully operate in new information rich environment by recognizing and understanding information needs, identifying and locating suitable information resource to meet the needs, evaluating the information in terms of its authenticity and reliability, and using the information effectively and ethically. IL skills are essential for the survival of academia, research, and lifelong learning. It is "a basic human right in the digital world" that "empowers people in all walks of life to seek, evaluate, use and create information effectively to achieve their personal, social, occupational and educational goals" (IFLA, 2005). The ever advancing and expanding e-knowledge web have facilitated researchers' access to vast amounts of unfiltered, unregulated, unsupported and unreliable information. IL skills become crucial for them as they rely more on online information for their research and lack necessary IL background. Although they may have sufficient knowledge and skills to operate and manage different technological devices, many a times they do not know how exactly to identify, locate, retrieve and evaluate information and its sources available to them (Deyrup and Bloom, 2012) and sometimes lack critical thinking skills (Breivik, 2005).

IL is defined as "a set of abilities requiring individuals to recognize when information is needed and have the ability to locate, evaluate and use effectively the needed information" (ACRL, 2000). It is information about information and the source of information. According to Koneru (2010) IL "is the competency that empowers one with the required knowledge about information, its nature and available formats; skills to fetch the relevant information by sifting the irrelevant, and attitude for consuming and sharing information, by ethical means and practices". Thus, IL is a skill, ability, capability and competency of a person that enables him to locate and retrieve relevant and authoritative information from multiple sources. It is not just application of routine information skill procedures; it is more than that. An information literate individual is able to determine the extent and articulate his specific need for information, possesses good understanding of his information environment, knows how to interact with different forms and formats of information, and is able to use information to fulfill his information need in an ethical manner. IL skills and competencies may be regarded as generic, consistent across subjects or specific within a subject. (Manuel, Beck and Molloy, 2005). It has been described as a catalyst for learning (Lloyd, 2006), essential for success in this age of information characterized by rapid technological changes (Rader, 2004).

Competency refers to the capability of using specific skills, abilities and knowledge essential to successfully perform a specific task in a defined work setting. It also serves as the basis for skill standards that specify the level of skills, abilities and knowledge essential for a specific task in a workplace and serves as criteria to measure competency attainment. The concept of core competency is prevalent in management theory and practice. The term was coined by Prahalad and Hamel (2006). It refers to the capabilities that are crucial in a business to achieve

competitive advantage. It consists of a pool of exceptional skills, knowledge, strategies and technical expertise that makes a distinction between a leader and an average player in the same business. Core competency leads to excellence and provides advantage over others. Information Literacy Core Competency (ILCC) is a combination of observable and measurable knowledge, skills, abilities and attributes to operate confidently in new information rich environment. Competency levels are useful as they help to differentiate in between individuals having basic skills and those who are experts.

Periodic assessment of learners is critically important for success of any education and training program, as it provides continuous impetus for improvement and its success. It is equally applicable to IL. "Assessment is the means for learning, not just the method of evaluation. It is designed to inform about the acquisition of skills and thought processes by the students" (Avery, 2004). For assessing information literacy competencies, from time to time, several standards and guidelines have been developed. In most of these standards and guidelines focus is more on five basic components: Information Need, Access, Evaluation, Use and Use Ethics. The study by Tirado, Alejandro Uribe (2012) presents a wonderful integration of IL standards and core competencies in each of them.

2. Objectives of the Study

The objectives of the study are:

- To assess researchers' ILCC level across different subjects with respect to Information need, access, evaluation, use and ethics;
- To find out the reasons for IL incompetency among researchers;
- To identify the areas of ILCC requiring improvement; and
- To suggest measures for improving ILCC among researchers

3. Hypothesis of the Study

H₀₁: There is no significant difference in the ILCC levels of researchers from different social science subjects with respect to '*Information Need*'.

H₀₂: There is no significant difference in the ILCC levels of researchers from different social science subjects with respect to '*Information Access*'.

H₀₃: There is no significant difference in the ILCC levels of researchers from different social science subjects with respect to '*Information Evaluation*'.

H₀₄: There is no significant difference in the ILCC levels of researchers from different social science subjects with respect to '*Information Use*'.

H₀₅: There is no significant difference in the ILCC levels of researchers from different social science subjects with respect to '*Information Use Ethics*'.

4. Scope and Limitation of Study

The study was conducted among the researchers enrolled for Ph.D. program in the Departments of History, Political Science, Economics, Sociology, Geography and Law at University of Delhi (DU), Jawaharlal Nehru University (JNU), Jamia Millia Islamia (JMI) and Indira Gandhi National Open University (IGNOU). These researchers hail from different parts of the country and provide a pan India representation. In the field of social sciences, the coverage of subjects

included having in view the basic characteristics of social science research, social behavior and social needs. The subjects like History, Political Science and Sociology cover the social behavioral subjects. The other subjects like Economics, Geography and Law cover the social needs etc. The study is limited to the researchers on roll during 2015-17 and selected concepts of ACRL Standards.

5. Population of Study

The study population consisted of 3443 researchers and questionnaires were distributed among 960 researchers on the basis of stratified random sampling method. The sampling was stratified by institution, discipline and gender. Total 520 responses complete in all respect, were received from the selected 960 researchers, which is higher than the sample size of 511 decided on 95% confidence level and 4% confidence intervals using the online sample size calculator of Creative Research System (2012), American Marketing Association.

6. Study Methodology

Questionnaire method has been used to collect relevant data. A schedule of 50 questions was framed on the basis of “*Information Literacy Competency Standards for Higher Education*” (ACRL, 2000). Each of the five standards was transformed into a set of ten questions to measure the ILCC level of researchers. The following key concepts were identified from ACRL’s standards and used to develop the questionnaire for the study.

Standard - I: ‘*Information Need*’ consisting of determination of extent and articulation of information need; identifying form and format of information; and selecting appropriate information places and sources.

Standard - II: ‘*Information Access*’ including skills and abilities to browse and search information; use of various search engines; and search strategy formulation for precise and relevant information retrieval.

Standard - III: ‘*Information Evaluation*’ with respect to reliability and authenticity of information available from various sources and in multiple forms and formats.

Standard - IV: ‘*Information Use*’ consisting of formats for information communication, information methodologies, information analysis and inferences.

Standard - V: ‘*Information Use Ethics*’ encompassing referencing, citation and plagiarism.

The responses were manually evaluated and 2 marks were allotted to each correct answer. To measure the ILCC level of respondents, the following Performance and Competency Scale was used (Singh and Kumar, 2019).

Table 1: Performance and Competency Scale

% of Marks	Grade	Performance	Competency
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		Grading	Level
91 and above	‘O’	Outstanding	Outstanding
81 to 90	‘E’	Excellent	Excellent
71 to 80	‘A’	Very Good	Very Good
61 to 70	‘B’	Good	Good
51 to 60	‘C’	Fair	Baseline
41 to 50	‘D’	Below Average	Minimal
Below 40	‘F’	Failed/Not Responded	Very Low

The Scale clearly indicates the percentage of marks and grade obtained, corresponding performance grade and the IL competency levels. The ‘Outstanding’ performance grade denotes that ILCC development is above the requirements, ‘Excellent’ performance grade denotes that ILCC development clearly meets the requirements, ‘Very Good’ performance grade denotes that ILCC development meets the requirements, ‘Good’ performance grade denotes that ILCC development meets the requirements but to a limited extent and ‘Fair’ level to ‘Failed/Not Responded’ performance grade denotes that ILCC development is below the requirements.

6.1 Statistical Techniques

Various techniques of descriptive and inferential statistics were applied for the analysis of the data. Descriptive statistics help understand the data. The descriptive statistics included frequency distribution, percentage, bar graph, etc and was aided by computing mean, standard deviation and range. Inferential statistics consisted of various tools like One-way ANOVA, F-ratio, and Post-Hoc test using LSD. Analysis of Variance (ANOVA) helps compare the relationship between two variables across more than two groups. One-way ANOVA has been applied “to compare the means of more than two groups or levels of an independent variable ...The F-ratio is the ratio of between groups variance to within groups variance. A significant F-ratio indicates that the population means are probably not all equal”. (Coakes, S. J., Steed, L., and Dzidic, P., 2006) Post-hoc Test helps the researchers to identify the differences between specific groups. In the present study Post-Hoc LSD (Least Significant Difference) Test has been applied to explore all possible pair-wise comparisons of means comprising a factor using the equivalent of multiple t-tests.

7. Review of Literature

The ever advancing technological developments having far reaching impact on information age have transformed “the ways in which users relate to and use information” (O’Gorman and Trott, 2009), making IL skills crucial for success in an information society. Zurkowski (1974) was the first to use the term “information literacy” to describe the information literate individual having necessary "techniques and skills". The term has formally been defined by Shapiro and Hughes

(1996), ACRL (2000), Johnstone and Webber (2003), CILIP (2004), Koneru (2010), and Muthumari and Tamilselvan (2014) as a set of skills and competencies that enables a person to identify information need; locate the precise and relevant information shuffling out the irrelevant from multiple sources and places; evaluate it in terms of authenticity and reliability; analyze and use it ethically to build new knowledge; and communicate the resulting information with the rest of the world. It has been considered a crucial skill for success in all academic disciplines and working world (Oakleaf, Millet, and Kraus, 2011).

IL is of utmost importance in view of the strategic value and use of information. Ferguson, Neely, and Sullivan (2006) have established that many a times students overestimate their skills and abilities with respect to online searching and evaluation of information sources. The researchers found students missing skills in Boolean operators, truncation and use of controlled vocabulary for precise and relevant information search. Students were also not comfortable in identifying citations of different parts of search results. Besides, the students expressed good level of confidence in their evaluation skills but they more often preferred web sources over peer-reviewed articles. Grassian and Kaplowitz (2001) suggests that all teaching departments including libraries need to justify the expenditure incurred or will risk their programs terminated in an era of financial crunch. Thus, IL assumes importance in promoting the use of electronic content in teaching, learning and research and to provide better return on investment for huge expenditure on subscription.

The IL assessment programs should serve number of purposes. It should diagnose the current level of knowledge and competence of the target group; should provide meaningful feedback for IL instruction modification and improvements; should determine the actual learning out come and overall success of the assessment program (Webber and Johnston (2003). The review studies conducted by Murtha, Stec, and Wilt (2006); Beile (2007); Oakleaf (2009a and b); Sobel and Sugimoto (2012); Kaplowitz (2014) advocate that IL assessment programs should serve three primary functions: “feedback to learners”; “feedback to instructors”; and “justify the value to administrators” and other stakeholders. The study by Pinkley and Hoffmann (2017) outlines the evolution of IL assessment process at California State University Library with a specific focus on 2013 assessment project. The primary goal of the assessment process has been to find the value of library in translating the IL assessment findings in actionable results and improve library IL services.

To assess ILCC, one should know what should be assessed, how it should be assessed, whether there is even a valid and feasible set of assessment tools, and so on (Farmer and Henry, 2008). According to Baldwin (2008), “assessment can relate to teaching or to the level of information literacy of the student, or it can be directed to a set of standards and outcomes, to library instruction programs, etc”. Brown and Niles (2013) offered the most comprehensive review of the IL assessment research, compiling a critical bibliography of 90 research studies assessing IL published after 2007. Schilling and Applegate (2012) reviewed IL assessment methods in use during 2007-2012. Indicating the pros and cons of each method used, researchers identified the popular methods and demonstrated “relationship between measures of attitudes, skills, and behavior”. They mostly found “affective measures than measures of skill and behavior”. Julien, Gross, and Latham (2018) conducted an online survey of academic librarians engaged in providing IL instruction in US to get an insight into their practices and challenges. The focus of study was pedagogical methods used; target audience; inclusion of technology in instruction;

assessment and evaluation methods used; common challenges faced; and collaboration among faculty, administration and librarian. It aimed to provide best practices in these areas.

Many measurement tools like standard classroom tests based on multiple choices, fill-in-the-blanks, and matching questions have been developed for information literacy assessment. Walsh (2009) has reviewed a representative literature of IL assessment aspects and tools. The study offers readers a flavour of the methods, including popular and illustrative examples, being used for IL assessment. It aims to provide a 'jumping off point' for introducing IL assessment in a specific institution. Oakleaf (2008) identified fixed-choice tests, performance assessment, and rubrics as major IL assessment tools. The study conducted by Williams (2017) enumerates specific strategies being used in IL activities at Belk Library, Appalachian State University in the qualitative and quantitative measurement of student learning outcomes. It suggests possible IL methodologies, data measurement tools for assessment and assessment of student learning into the curricula of academic institutions.

A well designed assessment and measurement process not only assists the learners to identify improvements in learning and areas for further developments, but also contributes to learning process itself. It should help the instructors identify whether teaching was successful, determine efficacy of instruction, and contribute in overall development. It should demonstrate value of IL programs and justify the need to administrators, parents, and learners themselves.

8. Profile of Respondents

The study measures ILCC level of the researchers enrolled for Ph.D. in select Universities. Subject wise there were 86 (16.5%) respondents from History, 96 (18.5%) from Political Science, 94 (18.1%) from Economics, 84 (16.2%) from Sociology, 78 (15.0%) from Geography and 82 (15.8%) respondents from Law. The detail of researchers from individual universities and subject concerned is presented in Table 2.

Table 2: Profile of Respondents

University Enrolled	Subject Area of Research						Total
	History	Political Science	Economics	Sociology	Geography	Law	
DU No.	20	20	20	20	20	22	122
%	16.4%	16.4%	16.4%	16.4%	16.4%	18.0%	100.0%
JMI No.	20	28	16	16	20	20	120
%	16.7%	23.3%	13.3%	13.3%	16.7%	16.7%	100.0%
JNU No.	22	24	22	24	24	26	142
%	15.5%	16.9%	15.5%	16.9%	16.9%	18.3%	100.0%
IGNOU No.	24	24	36	24	14	14	136
%	17.6%	17.6%	26.5%	17.6%	10.3%	10.3%	100.0%
Total No.	86	96	94	84	78	82	520
%	16.5%	18.5%	18.1%	16.2%	15.0%	15.8%	100.0%

7. Results and Discussions

As already stated the study questionnaire consisted of 10 questions related to each identified key concept of ACRL Standard. The responses were manually evaluated and 2 marks were allotted to each correct answer. The results and discussions on respondents' test performance grade and ILCC level are presented on each concept.

Information Need

Determination of extent and articulation of information need; identifying the form and format as well as places and sources of precise and relevant information needed is quite essential to successfully operate in the digital information environment. Out of the total 520 respondents, 20.8% were outstanding performers with 20 marks, 24.6% were excellent performers with 18 marks, and 16.2% were both very good performers and good performers with 16 and 14 marks respectively. The rest of the respondents consisted of 10.8% fair performers scoring 12 marks, 7.7% below average performers scoring 10 marks and 3.8% of the respondents failed the ILC assessment test on '*Information Need*'.

Of the total 20.8% outstanding performers, maximum 6.5% respondents were from Economics, followed by 4.2% from Law, 3.1% from both History and Political Science, 2.3% from Sociology and only 1.5% from Geography. The 24.6% excellent performers consisted of maximum 5.0% from sociology followed by 4.6% from both Political Science and Economics, 3.8% from History, 3.5% from Geography and 3.1% from Law. Of the total 16.2% of very good performers, maximum 4.0% were from Political Science, followed by 3.3% from Sociology, 2.5% from Geography, 2.3% from both History and Economics and 1.7% of the respondents were from Law. Similarly, of the total 16.2% of the good performers, maximum 3.5% were from both Sociology and Geography, followed by 3.1% from History, 2.3% from Economics and 1.9% of the respondents were from both Political Science and Law.

The maximum 2.1% of the respondents from both Economics and Geography, followed by 1.9% from Political Science and 1.5 % from History, Sociology and Law constituted the 10.8% of the fair performers on ILCC assessment test on '*Information Need*'. There were a total 7.7% of below average performers consisting of maximum 2.1% respondents from Law, followed by 1.9% from both History and Political Science, 1.5% from Geography and only 0.2% from Economics. None of the respondents from Sociology performed below average. A small number of 3.8% respondents, consisting of maximum 1.2% from Law, followed by 1.0% from Political Science, 0.8% from History, 0.6% from Sociology and only 0.4% respondents from Geography failed in the ILCC assessment test on ACRL Standard I on '*Information Need*'. None of the respondent from Economics failed the test. The performance grades for responses on queries related to '*Information Need*' is presented in Figure 1.

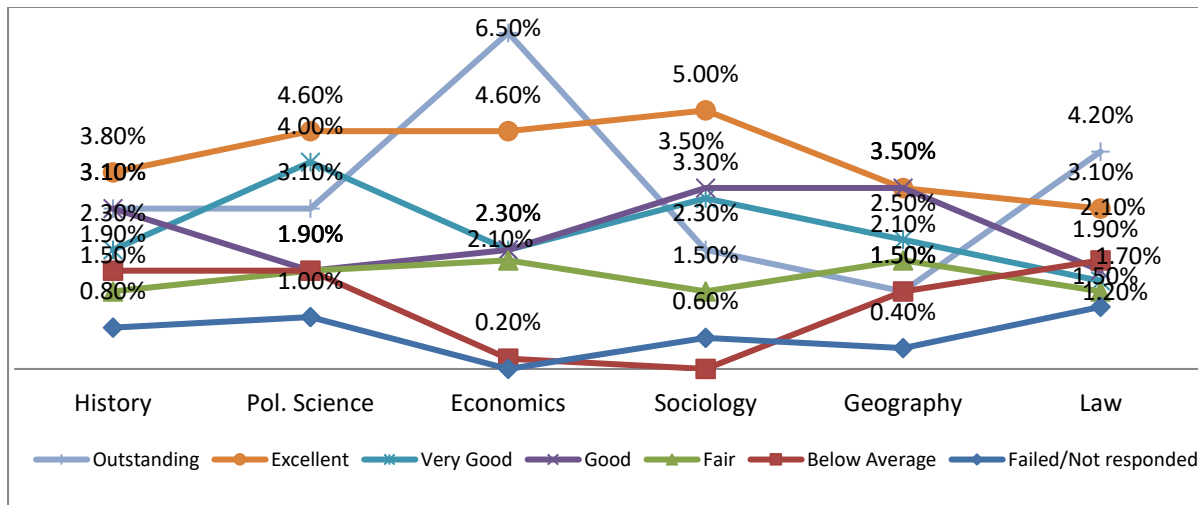


Figure 1: Performance Assessment of ILCC on ‘Information Need’

Thus, on the competency scale overall 77.7% of the respondents were found competent in ILCC to determine the extent and articulate the information needed. It included maximum 15.8% respondents from Economics followed by 14.0% from Sociology, 13.7% from Political Science, 12.3% from History and 11.0% from both Geography and Law. They have been found capable of using different synonymous keywords and provide right context for their information requirements. The rest 22.3% of the respondents (consisting of 10.8% ‘Baseline’, 7.7% ‘Minimal’ and 3.8% ‘Very Low’) were lacking in similar competency on ‘*Information Need*’. It included maximum 4.8% respondents from both Political Science and Law, followed by 4.2% from History, 4.0% from Geography, 2.3% from Economics and only 2.1% from Sociology.

Statistical Significance

The mean score of responses on ‘*Information Need*’ reflects different mean scores for each subject under study. Researchers from Economics have scored the highest mean score of 17.17, followed by Sociology with a mean score of 15.95, Political Science with a mean score of 15.50, Law with a mean score of 15.44, History with a mean score of 15.40 and Geography with a mean score of 14.87. The overall mean score is 15.75. It suggests that researchers from Economics possess higher ILCC followed by Sociology, Political Science, Law, History and Geography. The mean plot also reveals that in terms of ‘*Information Need*’, the researchers from Economics have shown higher ILCC followed by researchers from Sociology, Political Science, Law, History and Geography.

Tenability of Hypothesis

H₀₁: There will be no significant difference in the ILCC levels of researchers from different social science subjects with respect to ‘*Information Need*’.

ANOVA and Post Hoc Tests

One-way ANOVA was performed to examine difference in ILCC level of researchers across subjects. The results indicate there were significant differences.

$$F(5, 514) = 4.457, p = 0.001$$

Further, Post Hoc analysis using LSD was performed between the subjects. It shows that there were no significant differences in ILCC level of researchers from different subjects except between Economics and History, Economics and Political Science, Economics and Sociology, Economics and Geography and Economics and Law.

To sum up, the mean score and Post-hoc analysis of responses from different subjects for '*Information Need*' is significant at 0.05 level. Hence, the hypothesis (H_{01}) stands rejected. Further, there were significant difference between Economics and History, Economics and Political Science, Economics and Sociology, Economics and Geography and Economics and Law.

Information Access

Researchers are the highest consumers as well as producers of information. There is no dearth of information in electronic information environment, it is available in plenty. The researchers need to possess high level of information handling skills for precise and relevant information access from multiple sources and in different forms and formats. The ACRL Standard II deals with the skills and abilities to access the needed information effectively and efficiently. In terms of information access, the test performance of respondents across subjects was found to be very poor. Of the total 520 respondents, there were only 1.5% outstanding performers scoring 20 marks, 8.5% excellent performers scoring 18 marks, 17.7% very good performers scoring 16 marks, 26.2% good performers scoring 14 marks, 18.1% fair performers scoring 12 marks, 13.5% below average performers with 10 marks and 14.6% of the respondents failed the ILC assessment test on '*Information Access*'.

Thus, maximum 26.2% of good performers consisted of highest 6.2% respondents from Economics, followed by 5.2% from Political Science, 4.3% from Geography, 4.0% from Sociology, 3.6% from Law and 2.7% from History. 17.7% of the very good performers consisted maximum of 3.8% from History, followed by 3.5% from both Political Science and Law, 3.1% from Economics, 2.7 from Sociology and 1.2% from Geography. Of the 8.5% excellent performers, maximum 2.1% were from Economics, followed by 1.9% from both History and Law, 1.7% from Geography and 0.8% from Sociology. None of the respondents from Political Science was found to be an excellent performer. The 1.5% of outstanding performers consisted of maximum 0.8% from Economics and 0.4% from both Political Science and Law. None of the respondents from History, Sociology and Geography was an outstanding performer.

Of the total 18.1% fair performers, maximum 5.0% of respondents were from Sociology, followed by 3.1% from both Economics and Geography, 2.7% again from both History and Political Science, and only 1.5% from Law. The 13.5% below average performers consisted of maximum 3.3% respondents from Law, followed by 3.1% from Political Science, 2.7% from History, 1.9% from Sociology, 1.3% from Economics and 1.2% from Geography. The maximum 3.7% of the respondents from Political Science, followed by 3.5% from Geography, 2.7% from History, 1.7% from Sociology and 1.5% from both Economics and Law constituted the total

14.6% of the respondents who failed the ILC assessment test. The performance grades for responses related to the queries on ‘*Information Access*’ is presented in Figure 2.

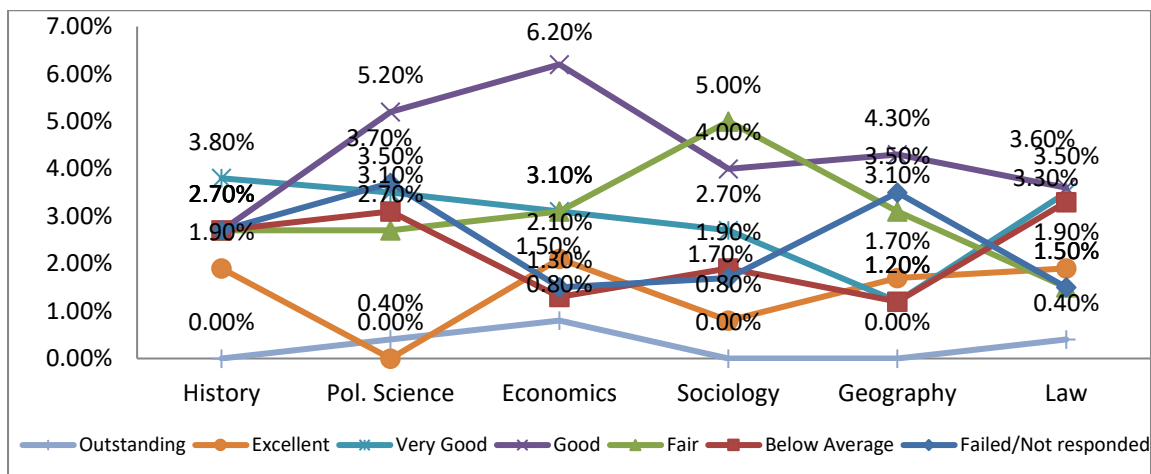


Figure 2: Performance Assessment of ILCC on ‘Information Access’

On the competency scale overall 53.8% of the respondents (consisting of 1.5% ‘Outstanding’, 8.5% ‘Excellent’, 17.7% ‘Very Good’ and 26.2% ‘Good’ scorers) were found competent in ILCC to access needed information effectively and efficiently. It included maximum 12.1% respondents from Economics followed by 9.4% from Law, 9.0% from Political Science, 8.5% from History, 7.5% from Sociology and 7.3% from Geography. They were capable to identify the right information source and refine search results using multiple limiters. The rest 46.2% of the respondents (consisting of 18.1% ‘Baseline’, 13.5% ‘Minimal’ and 14.6% ‘Very Low’) were missing similar competency to access the needed information. It included maximum 9.4% respondents from Political Science followed by 8.7% from Sociology 8.1% from History, 7.7% from Geography, 6.3% from Law and 6.0% from Economics.

Statistical Significance

The responses on ‘*Information Access*’ reflects different mean scores for each subject under study. Researchers from Economics have scored a higher mean score of 13.83, followed by Law with a mean score of 13.46, History with a mean score of 12.93, Sociology with a mean score of 12.69, Geography with a mean score of 12.31 and Political Science with a mean score of 11.81. The overall mean score is 12.84. Mean scores suggest that research scholars from Economics possess higher ILCC followed by research scholars from Law, History, Sociology, Geography and Political. The mean plot also expresses the difference of mean scores across subject and reveals that in terms of ‘*Information Access*’, the researchers from Economics have shown the highest information literacy competency followed by Law, History, Sociology, Geography and Political Science researchers.

Tenability of Hypothesis

H₀₂: There will be no significant difference in the ILCC levels of researchers from different social science subjects with respect to ‘*Information Access*’.

ANOVA and Post Hoc Tests

One-way ANOVA was performed to examine difference in ILCC level of researchers across subjects. The results indicate there were significant differences.

$$\mathbf{F(5, 514) = 4.238, p= 0.001}$$

Further, Post Hoc analysis using LSD was performed between the subjects. It shows that there were no significant differences in ILCC levels of researchers across subjects except between Political Science and History; Political Science and Economics; Political Science and Law; Economics and Sociology; Economics and Geography; and Geography and Law.

To sum up, the mean score and Post-hoc analysis of responses from different subjects on 'Information Access' is significant at 0.05 level. Hence, the hypothesis (H_{02}) is rejected. Further, there were significant differences between Political Science and History; Political Science and Economics; Political Science and Law; Economics and Sociology; Economics and Geography; and Geography and Law.

Information Evaluation

Critical evaluation of information and its sources to identify and establish the authenticity and reliability of information is essential in the digital world. The researchers' skills and competency with respect to evaluation of information and its sources was assessed. Out of the total 520 respondents, there were 8.1% outstanding performers with 20 marks, 18.8% excellent performers with 18 marks, 18.1% very good performers with 16 marks, and 21.9% good performers with 14 marks. The rest 13.8% were fair performers scoring 12 marks, 8.5% below average performers with 10 marks and 10.8% of the respondents failed the ILCC assessment test on '*Information Evaluation*'.

Thus, for '*Information Evaluation*' the highest 21.9% of the respondents were good performers, consisting of maximum 6.0% from Sociology, followed by 4.0% from Political Science, 3.5% from Geography, 3.1% from Economics, and 2.7% from both History and Law. Of the total 18.8% excellent performers in ILCC test, maximum 4.0% were from Political Science, followed by 3.5% from History, 3.1% from Economics, 2.9% from both Sociology and Geography and 2.5% from Law. Out of 18.1% very good performers, maximum 6.2% were from Economics followed by 4.2% from Sociology, 2.5% from Law, 1.9% from History, 1.7% from Geography and 1.5% from Political Science. The maximum 1.9% of respondents from Political Science and Law, followed by 1.5% from Economics, 1.2% from both Geography and History and only 0.4% of the respondents from Sociology constituted 8.1% of outstanding performers in ILCC assessment test on '*Information Evaluation*'.

There were a total 13.8% of fair performers, consisting of maximum 3.7% from Political Science, followed by 2.5% from Economics, 2.3% from both History and Law, 1.7% from Geography and 1.3% from Sociology. Of the total 8.5% below average performers in ILCC test, maximum 2.1% of the respondents were from Political Science, followed by 1.9% from Law, 1.5% from History, 1.3% from Geography, 1.0% from Sociology and 0.6% from Economics. The total 10.8% of respondents including 3.5% from History, 1.2% from both Political Science and Economics, 0.4% from Sociology, 2.7% from Geography and 1.9% from Law failed the ILC

assessment test on ‘*Information Evaluation*’. The performance grades for responses related to the queries on ‘*Information Evaluation*’ are presented in Figure 3.

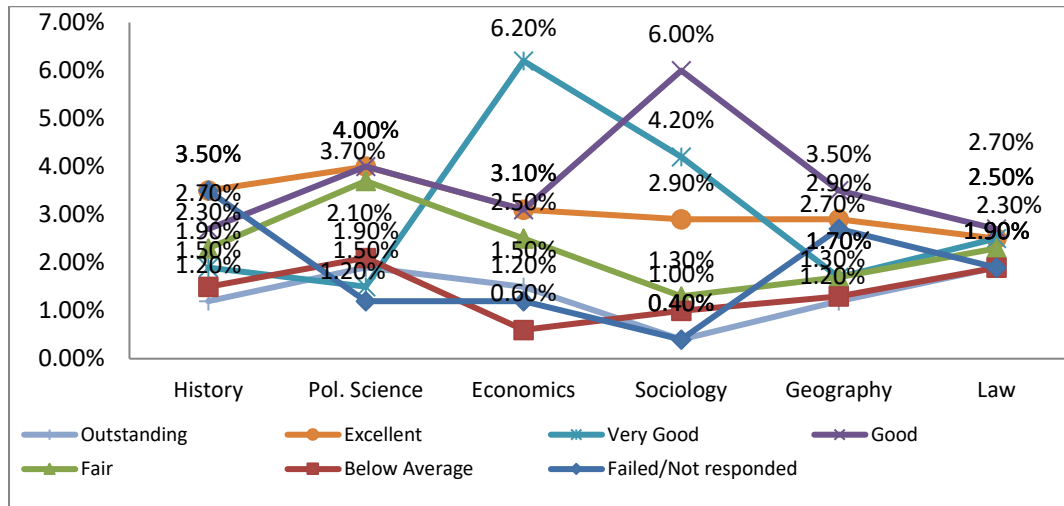


Figure 3: Performance Assessment of ILCC on ‘Information Evaluation’

Compared to ‘*Information Access*’, the performance of respondents on the competency scale was fairly good on ‘*Information Evaluation*’. Overall 66.9% of the respondents (consisting of 8.1% ‘Outstanding’, 18.8% ‘Excellent’, 18.1% ‘Very Good’ and 21.9% ‘Good’) were found competent in ILCC to evaluate information and its sources critically for its reliability and authenticity. It included maximum 13.8% respondents from Economics followed by 13.4% from Sociology, 11.5% from Political Science, 9.6% from Law, and 9.2% from both History and Geography. These researchers were able to identify peer-reviewed information and its sources and shuffle out the questionable information. The rest 33.1% of the respondents (consisting of 13.8% ‘Baseline’, 8.5% ‘Minimal’ and 10.8% ‘Very Low’) did not possess similar competency on standard III. It included maximum 7.3% respondents from History followed by 6.9% from Political Science 6.2% from Law, 5.8% from Geography, 4.2% from Economics and 2.7% from Sociology.

Statistical Significance

The responses on ‘*Information evaluation*’ across subjects reflect different mean scores for each subject under study. Researchers from Economics have scored a higher mean score of 15.09, followed by Sociology with a mean score of 14.83, Political Science with a mean score of 14.19, Law with a mean score of 13.98, Geography with a mean score of 13.59, and History with a mean score of 13.35. The overall mean score is 14.19. The mean score and mean plot suggests that researchers from Economics possess higher ILCC followed by Sociology, Political Science, Law, Geography, and History.

Tenability of Hypothesis

H₀₃: There will be no significant difference in the ILCC levels of researchers from different social science subjects with respect to ‘*Information Evaluation*’.

ANOVA and Post Hoc Tests

One-way ANOVA was performed to examine difference in ILCC level of researchers across subjects. The results indicate there were significant differences.

$$\mathbf{F(5, 514) = 2.792, p= 0.017}$$

Further, Post Hoc analysis using LSD was performed between the subjects. It shows that there were no significant differences across researchers of different subjects except between History and Economics, History and Sociology, Economics and Geography, and Sociology and Geography.

To sum up, the mean score and Post-hoc analysis of researchers' responses from different subjects for '*Information Evaluation*' is significant at 0.05 level. There were significant difference between History and Economics, History and Sociology, Economics and Geography, and Sociology and Geography, hence, the hypothesis (H_{03}) stands rejected.

Information Use

In the new information environment, information is available in abundance. The users of information, especially, the researchers should possess necessary skills to effectively use information to accomplish a specific purpose. Out of the total 520 respondents, maximum 28.5% respondents were excellent performers with 18 marks, followed by 20.4% outstanding performers with 20 marks, 15.8% very good performers with 16 marks, and 11.5% good performers with 14 marks. The rest were 10.8% fair performers with 12 marks, 6.5% below average performers with 10 marks and 6.5% of the respondents failed the ILCC assessment test on '*Information Use*'.

The overall performance of researchers in ILCC assessment test on standard IV was good. As many as 28.5% of the respondents were found excellent performers consisting maximum of 5.6% from Sociology, followed by 5.4% from History, 5.0% from Economics, 4.8% from both Political Science and Law and 2.9% from Geography. There were 20.4% outstanding performers including maximum 5.2% from Economics, followed by 3.5% from both History and Sociology, 3.3% from Geography, 3.1 from Law and 1.9% from Political Science. Of the 15.8% very good performers, maximum 4.2% were from Political Science, 3.5% from Economics, 2.3% from Sociology, 2.0% from both Geography and Law and 1.5% from History. There were a total of 11.5% good performers consisting of 1.9% from History, 1.2% from Political Science, 2.5% from both Economics and Geography, 3.1% from Sociology and 0.4% from Law.

Of the total fair performers in ILCC assessment test, maximum 3.1% were from Political Science, followed by 2.7% from Law, 2.3% from Geography, 1.2% from Economics and 0.8% from both History and Sociology. The maximum 1.9% of the respondents from History, followed by 1.5% from Political Science, 1.2% from Law, 0.8% from both Economics and Geography and only 0.4% from sociology constituted the total 6.5% of the respondents who performed below average. The total 6.5% of respondents, who failed the ILC assessment on '*Information Use*' consisted of maximum 1.7% from Political Science, followed by 1.5% from both History and Law, 1.2% from Geography and 0.6% from Sociology. None of the respondents from Economics failed in the ILCC assessment test. The performance grades for responses related to the queries on '*Information Uses*' is presented in Figure 4.

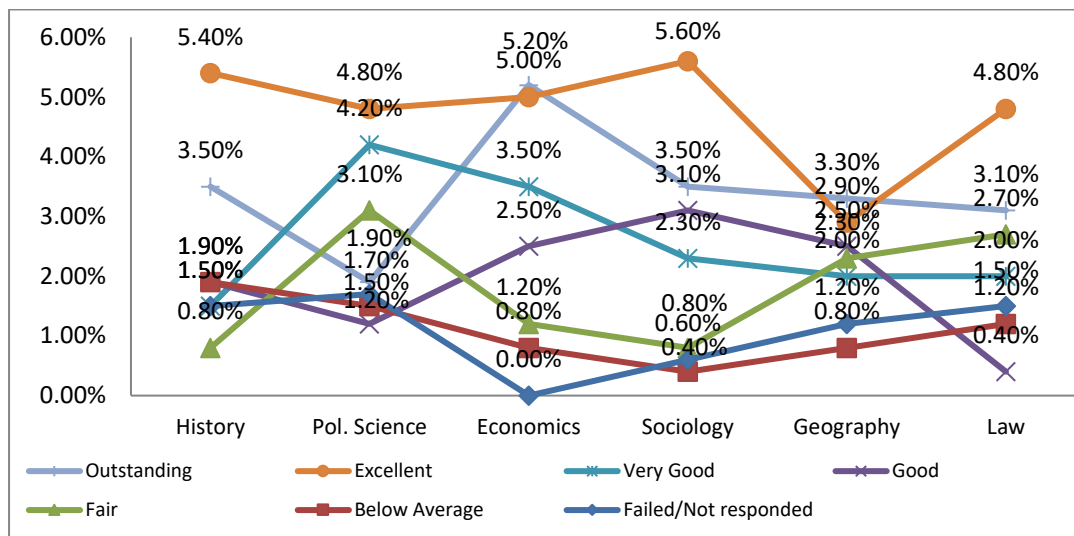


Figure 4: Performance Assessment of ILCC on 'Information Use'

Thus, on the competency scale 76.2% of respondents (consisting of 20.4% 'Outstanding', 28.5% 'Excellent', 15.8% 'Very Good' and 11.5% 'Good') were found having ILCC in information use to accomplish a specific purpose. It included maximum 16.2% respondents from Economics followed by 14.4% from Sociology, 12.3% from History, 12.1% from Political Science, 10.8% from Geography and 10.4% from Law. These researchers were capable to comprehend information available in different forms and formats and use the same for a specific purpose. The rest 23.8% of the respondents (consisting of 10.8% 'Baseline', 6.5% 'Minimal' and again 6.5% 'Very Low') were found lacking similar competency in ILCC. It included maximum 6.3% respondents from Political Science, followed by 5.4% from Law 4.2% from both History and Geography, 1.9% from Economics and 1.7% from Sociology.

Statistical Significance

The responses for ILCC on '*Information Use*' reflect different mean scores for each subject. Researchers from Economics have scored a higher mean score of 16.91, followed by Sociology with a mean score of 16.45, History with a mean score of 15.40, Law with a mean score of 15.34, Geography with a mean score of 15.18, and Political Science with a mean score of 14.69. The overall mean score is 15.67. It suggests that research scholars from Economics possess higher ILCC, followed by Sociology, History, Law, Geography, and Political Science. The mean plot also reflects the difference of mean score across subjects and reveals that in terms of '*Information Use*', the researchers from Economics have shown the highest ILCC followed by researchers from Sociology, History, Law, Geography, and Political Science.

Tenability of Hypothesis

H₀₄: There will be no significant difference in the ILCC levels of researchers from different social science subjects with respect to '*Information Use*'.

ANOVA and Post Hoc Tests

One-way ANOVA was performed to examine difference in ILCC level of researchers across subjects. The results indicate there were significant differences.

$$F(5, 514) = 4.223, p = 0.001$$

Further, Post Hoc analysis using LSD was performed between the subjects. It shows that there were no significant differences across the researchers of different subjects except between Economics and History, Economics and Political Science, Economics and Geography, Economics and Law, Sociology and Political Science, and Sociology and Geography.

To sum up, the mean score and Post-hoc analysis of ILCC levels of researchers from different subjects for '*Information Use*' is significant at 0.05 level. Hence, the hypothesis (H_{04}) is rejected. Further, there were differences between Economics and History, Economics and Political Science, Economics and Geography, Economics and Law, Sociology and Political Science and Sociology and Geography.

Information Use Ethics

IL skills to deal with information abundance and manage information in the ICT age having multiple similarity detection software and stringent legal provisions are highly important. Of the total 520 respondents, 6.2% were outstanding performers with 20 marks, 28.5% were excellent performers with 18 marks, 26.9% were very good performers with 16 marks and 18.1% were good performers with 14 marks. The rest of respondents were 10.4% fair performers scoring 12 marks, 3.8% below average performers with 10 marks and 6.2% of the respondents failed the ILC assessment test on '*Information Use Ethics*'.

There were 6.2% outstanding performers, consisting of maximum 2.1% from Economics, followed by 1.2% from both Political Science and Sociology, 0.8% from Law, 0.6% from Geography and only 0.4% from History. The performance of maximum 28.5% of the respondents was excellent including in descending order 8.5% from Economics, 4.6% from Political Science, Sociology and Law, 4.2% from History and 1.9% from Geography. Of the total 26.9% very good performers, maximum 6.0% were from Political Science, followed by 5.0% from Economics, 4.8% from Sociology, 4.2% from History, 4.0% from Geography and 2.9% from Law. Similarly, of the total 18.1% of the good performers, maximum 4.4% were from Geography, followed by 4.2% from History, 3.3% from Political Science, 3.1% from Law, 2.1% from Sociology and 1.0% from Economics.

There were 10.4% of fair performers, consisting of maximum 3.7% from Geography, followed by 2.3% from Political Science, 1.5% from both Sociology and Law, 0.8% from History and 0.6% from Economics. Similarly, 3.8% of below average performers consisted of maximum 1.5% from History, 1.3% from law, 0.6% from Economics and 0.4% from Political Science. There were no below average performers from Sociology and Geography.

The maximum 1.9% of the respondents from Sociology, followed by 1.5% from Law, 1.2% from History, 0.8% from Political Science and only 0.4% from Economics and Geography constituted 6.2% of the respondents who failed in the ILCC assessment test on '*Information Use Ethics*'. The performance grades for responses related to the queries on '*Information Use Ethics*' is presented in Figure 5.

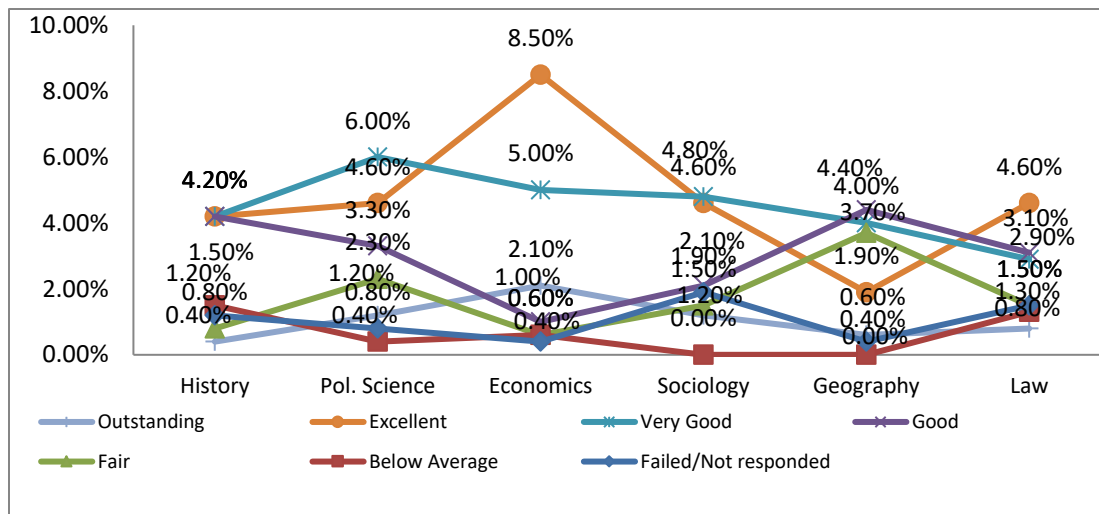


Figure 5: Performance Assessment of ILCC on ‘Information Use ethics’

On the competency scale 79.6% of the respondents were found ILCC competent to use information ethically and legally. It included maximum 16.5% respondents from Economics followed by 15.0% from Political Science, 13.1% from History, 12.7% from Sociology, 11.3% from Law and 11.0% from Geography. They have shown competency to properly quote, summarize and paraphrase information and idea from multiple sources and use it with proper citation. The rest 20.4% of the respondents (consisting of 10.4% ‘Baseline’, 3.8% ‘Minimal’ and 6.2% ‘Very Low’) were found lacking competency in ‘*Information Use Ethics*’. It included maximum 4.4% respondents from Law 4.0% from Geography, 3.5% from History, Political Science and Sociology and minimum of 1.5% from Economics.

Statistical Significance

The respondents’ responses for queries related to ‘*Information Use Ethics*’ reflect different mean scores for each subject under study. The researchers from Economics has scored a higher mean score of 16.81, followed by Political Science with a mean score of 15.35, Sociology with a mean score of 15.12, History with a mean score of 14.74, Law with a mean score of 14.71, and Geography with a mean score of 14.49. The overall mean score is 15.25. It suggests that research scholars from Economics possess higher ILCC, followed by Political Science, Sociology, History, Law, and Geography. The mean plot also expresses difference of mean score across subjects and reveals that researchers from Economics have shown the highest ILCC followed by researchers from Political Science, Sociology, History, Law, and Geography.

Tenability of Hypothesis

H₀₅: There will be no significant difference in the ILCC levels of researchers from different social science subjects with respect to ‘*Information Use Ethics*’.

ANOVA and Post Hoc Tests

One-way ANOVA was performed to examine difference in ILCC level of researchers across subjects. The results indicate there were significant differences.

$$F(5, 514) = 6.326, p = 0.000$$

Further, Post Hoc analysis using LSD was performed between the subjects. It shows that there were no significant differences in ILCC level of researchers from different subjects except between Economics and History, Economics and Political Science, Economics and Sociology, Economics and Geography, and Economics and Law.

To sum up, the mean score and Post-hoc analysis of responses from different subjects for '*Information Use Ethics*', is statistically significant at 0.05 level. Hence, the hypothesis (H_{05}) stands rejected. Further there were significant differences between Economics and History, Economics and Political Science, Economics and Sociology, Economics and Geography, and Economics and Law.

10. Findings and Suggestions

The major findings are:

- The researchers from Economics have displayed higher level of ILCC on each ACRL Standard compared to researchers from other subjects.
- The study has found significant difference in the ILCC levels of researchers from different social science subjects with respect to '*Information Need*', '*Information Access*', '*Information Evaluation*', '*Information Use*', and '*Information Use Ethics*'.
- Researchers did not possess equal ILCC on all key concepts. The maximum 79.6% of researchers on '*Information Use Ethics*', followed by 77.7% of researchers on '*Information Need*', 76.2% of researchers on '*Information Use*', 66.9% of researchers on '*Information Evaluation*' and only 53.8% of researchers on '*Information Access*' have been found to possess ILCC.
- The researchers have shown different levels of ILCC on different key concepts. On '*Information Need*' there were 20.8% 'Outstanding', 24.6% 'Excellent', 16.2% both 'Very Good' and 'Good' respondents; on '*Information Access*' there were 1.5% 'Outstanding', 8.5% 'Excellent', 17.7% 'Very Good' and 26.2% 'Good' respondents; on '*Information Evaluation*' there were 8.1% 'Outstanding', 18.8% 'Excellent', 18.1% 'Very Good' and 21.9% 'Good', respondents; on '*Information Use*' there were 20.4% 'Outstanding', 28.5% 'Excellent', 15.8% 'Very Good' and 11.5% 'Good' respondents; and on '*Information Use Ethics*' there were 6.2% 'Outstanding', 28.5% 'Excellent', 26.9% 'Very Good' and 18.1% 'Good' respondents.
- The number of researchers possessing ILCC on each key concept from different subjects was not equal. The IL competent researchers on '*Information Need*' were maximum 15.8% from Economics, followed by 14.0% from Sociology, 13.7% from Political Science, 12.3% from History and 11.0% from both Geography and Law; on '*Information Access*' were maximum 12.1% from Economics followed by 9.4% from Law, 9.0% from Political Science, 8.5% from History, 7.5% from Sociology and 7.3% from Geography; on '*Information Evaluation*' were maximum 13.8% from Economics followed by 13.4% from Sociology, 11.5% from Political

Science, 9.6% from Law, and 9.2% from both History and Geography; on '*Information Use*' were maximum 16.2% from Economics followed by 14.4% from Sociology, 12.3% from History, 12.1% from Political Science, 10.8% from Geography and 10.4% from Law; and on '*Information Use Ethics*' were maximum 16.5% from Economics followed by 15.0% from Political Science, 13.1% from History, 12.7% from Sociology, 11.3% from Law and 11.0% from Geography.

- The maximum 26.2% of researchers on '*Information Access*' followed by 21.9% of researchers on '*Information Evaluation*', 18.1% of researchers on '*Information Use Ethics*', 16.2% of researchers on '*Information Need*' and only 11.5% of researchers on '*Information Use*' have displayed only 'Good' level of ILCC. These researchers, though could operate in electronic information settings, but essentially require to brush up their IL skills on specific parameters and improvise ILCC level.
- A close analysis of the above findings reveals that maximum 46.2% of researchers on '*Information Access*' followed by 33.1% of researchers on '*Information Evaluation*', 23.8% of researchers on '*Information Use*', 22.3% of researchers on '*Information Need*' and 20.4% of researchers on '*Information Use Ethics*' were lacking in ILCC.
- The findings related to number of IL incompetent researchers on each key concept from different subjects is of great concern. The IL incompetent researchers on '*Information Need*' were maximum 4.8% from both Political Science and Law, followed by 4.2% from History, 4.0% from Geography, 2.3% from Economics and only 2.1% from Sociology; on '*Information Access*' were maximum 9.4% from Political Science, followed by 8.7% from Sociology 8.1% from History, 7.7% from Geography, 6.3% from Law and 6.0% from Economics; on '*Information Evaluation*' were maximum 7.3% from History followed by 6.9% from Political Science 6.2% from Law, 5.8% from Geography, 4.2% from Economics and 2.7% from Sociology; on '*Information Use*' were maximum 6.3% from Political Science, followed by 5.4% from Law, 4.2% from both History and Geography, 1.9% from Economics and 1.7% from Sociology; and on '*Information Use Ethics*' were maximum 4.4% from Law 4.0% from Geography, 3.5% from History, Political Science and Sociology and minimum of 1.5% from Economics.

11. Discussions

Adequate level of ILCC is essential among researchers to successfully operate in the new information rich environment. They should be efficient to determine the extent and articulate information need, browse and precisely search relevant information, evaluate it and critically analyse its reliability and authenticity. They should know why, when, and how to use information and its tools in an ethical and legal manner. The study has attempted to measure the IL core competency of the social science researchers. The findings have clearly established that many a researchers are far behind competency level and possess only baseline or below IL skills. During the research multiple reasons were observed and identified for the IL incompetency of researchers. It includes limited IL activities that are not based on models and standards, no provisions for earmarked IL unit in the universities, IL content missing from the Ph.D. course work, and lack of structured IL activity for the researchers. Both librarians and researchers have reported multiple challenges in promoting ILCC. Some significant challenges include lack of time, lack of adequate staffing, lack of formal training of library staff, shortage of space and technology, lack of student motivation, lack of support from administration and faculty indifference to IL activities.

Our continuous advancing society requires a reasonable level of ILCC for production of good quality research and academics. In order to improve the ILCC level of researchers, improvement in following areas is required in order of priority.

- ILCC in effective and efficient ‘Information Access’;
- ILCC in ‘Information Evaluation’ in terms of authenticity and reliability;
- ILCC in effective ‘Information Use’ to accomplish a specific purpose;
- ILCC to determine the extent and articulate ‘Information Need’; and
- ILCC to understand economic, legal and social issues pertaining to ‘Information Use Ethics’.

For developing and improving upon the existing ILCC levels of the researchers a lot is still to be done. It is suggested that the university libraries should start a combination of IL activities. On priority an earmarked, full time IL Unit/ Centre/ Cell with well qualified staff and suitable infrastructure for hands on training should be developed and maintained by each university. It is not necessary that each and every library professional may possess higher level of ILCC. Thus, imparting training and education to professionals through ‘Training the Trainer Program’ at first hand is essential and need of the hour. IL skill content should be made part of Ph.D. course work under UGC guidelines. Universities may also start a credit based and curriculum integrated IL course at undergraduate and post graduate levels. Internet has facilitated a strong platform for online academic activities. Large number of teaching and learning tools and courses are available for various purposes. University libraries may fruitfully utilize this platform and provide ‘Online Information Literacy Tutorials’ facilitating IL skill learning in a 24X7 environment. For successful implementation of all IL activities a close collaboration between the teaching faculty and the library professionals is essential.

12. Conclusions

The majority of researchers today are from the “millennial” (Allison, 2013), (Becker, 2012), (Taylor, 2012) generation. They are habitual of effortless access to enormous amount of information and are generally reluctant to invest significant effort and time to locate, search and retrieve required information (D’Couto and Rosenhan, 2015), (Taylor, 2012). While addressing their information requirements, they would rather prefer Internet, using search engine like Google, than efficiently searching and retrieving information from academic databases (Greenberg and Bar-Ilan, 2014) which are more complex. These researchers may have sound technological understanding to manage and use different devices, many a times they do not exactly understand what, where and how to locate, search and retrieve precise and relevant information required from all the sources available to them (Deyrup and Bloom, 2012). Many a times they lack critical thinking skills (Breivik, 2005) while accessing information to differentiate between reliable and unreliable sources of information. They may have expertise in internet surfing but they lack IL skills (Allison, 2013).

Today, information is available in multiple formats and from many sources. The growing ocean of information on the ever evolving web is important in teaching, learning and research. It is

essential to make the information users, particularly the researchers, competent in ILCC to operate successfully in the digital environment. The onus is on libraries and information centers “to empower the students, researchers and faculty members to seek, evaluate, use and create information effectively and efficiently to achieve their educational, social, occupational and personal goals” (Singh and Kumar, 2018). “In the contemporary environment of rapid technological change and proliferating information resources it is increasingly important that the users, particularly the researchers are equipped with advanced skills of information literacy” (Singh and Majumdar, 2009). The findings of the study may fruitfully be applied to construct and restructure IL plans and activities to inculcate the required skills among social science researchers and reap the benefits of new information rich environment.

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