Research Data Management and Data Sharing among Research Scholars of Life Sciences and Social Sciences

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ABSTRACT

This study investigates perception of research scholars towards research data management and sharing. A survey was conducted among research scholars from Faculty of Life Sciences and Social Sciences, Aligarh Muslim University (AMU). In total, 352 participants filled out the questionnaire. The study shows that research scholars of Faculty of Social Sciences are more willing to share their research data as compared to Research Scholars of Life Sciences. Contributing to scientific progress and increasing research citations and visibility were the key factors that motivated researchers to share data. However, confidentiality and data misuse were the main concerns among those who were unwilling to share. Finally, some recommendations to improve the of data management and sharing practices are presented.

Keywords: Research data management; Research data sharing; Scholarly communication; Data preservation; Research scholars.

1. INTRODUCTION

Data are the building blocks of empirical research, whether in the social, behavioral, biological, or physical sciences. To view and extend the work of others, researchers often require access to the data on which that work is based. Research data management and sharing have become critical because of their important and valuable role in enhancing science through building on previous works by reusing data produced and acquired by other researchers. Research data includes every piece of data acquired and generated during the research process. Research data comes in many different formats and is gathered using a wide variety of methodologies and may comprises, among others, text, spreadsheets, questionnaires, photographs, films, test responses, laboratory notes, statistics, observations, slides, results of experiments, samples, scripts, algorithms, workflows, scripts, interview notes and many other forms. Research data can be defined as recorded authentic material often accepted in the scientific community as necessary to prove research findings; although the majority of such data is created in digital format, all research data is included regardless of the format in which it is created.

Data sharing is not a new concept in scholarly communication. It refers to the practice of making data used for academic research available to other investigators. A number of funding agencies and science journals require authors of peer-reviewed papers to share any additional information necessary to understand develop or reproduce published research. The data sharing practices must be followed as they help to verify the research findings, data of publicly funded research must be accessible to one and all to see, verify, reinterpret and re-analyse; this will lead to the broadening of the extreme limits of knowledge. Other researchers in the field can evaluate data from a different perspective thus more knowledge and theories may be generated conserving the time spent for data generation. Sharing data has many benefits and it is manifestly clear and widely accepted. Research Data Management (RDM) plan is a plan which identifies the type of data that will be generated, how it will be documented, stored, and shared. In addition to any further information such as copyright, backup, responsibilities, and cost, etc.

2. LITERATURE REVIEW

Review of literature facilitates the researcher to acquire knowledge on a topic under consideration for research and it also helps in avoiding duplication of work. For this work the investigator has collected articles from various sources such as Emerald Insight, Research Gate, ProQuest and different academic journals related to several disciplines. After reviewing several articles published in various journals, the investigators have selected the most relevant articles which fulfill the purpose of the literature review.

Elsayed, A.M. & Saleh, E.I. A study was conducted and it has underscored that researchers’ personal experience is their only source of guidance for data management plan and only 42 per cent were unfamiliar with data managements plans. Regarding sharing data, researchers’ at the three Arab Universities displayed a positive attitude towards sharing data, especially older researchers. Tripathi, M, et al. investigated...
3. OBJECTIVES OF THE STUDY

The present study is aimed to analyse and compare the research data management and sharing activities among researchers of Faculty of Life Sciences and Social Sciences at AMU, Aligarh.

The major objectives are:

- To identify and compare how research scholars of Faculty of Life Sciences and Social Sciences share their data
- To examine and compare the use of data management plan in both the faculties
- To study and compare the reasons due to which research scholars share their own data
- To identify and compare the type of research data do research scholars share among others
- To examine and compare how do they share research data with other researchers
- To study and compare the duration and ways in which research scholars preserve their data
- To identify and compare the factors that influence the sharing of data among research scholars.

4. METHODOLOGY

Methodology has its importance in scientific investigation because impartiality in any research cannot be obtained unless it is carried out in a very systematic and planned manner. Questionnaire method was used to collect data from research scholars. For this present study, investigators have used the modified version of questionnaire developed by A.M. Elsayed and E.I. Saleh, in their study (2018) entitled, “Research Data Management and Sharing among researchers in Arab Universities: An exploratory study”. For this very purpose, questionnaires of open ended in nature for research scholars of two faculties, have been prepared. A total number of 410 questionnaires were administered among the research scholars of Faculty of Life Sciences and Social Sciences, AMU, out of which 354 questionnaires were returned. Response rate is 86.34 per cent. Among these questionnaires, 352 were considered for the analysis of data as 2 were found incomplete.

4.1 Sample Technique

- Departments were selected using Census and Random sampling method. In the case of Faculty of Life Sciences, departments were selected according to Census method as the Faculty consists of five departments only. In the case of Faculty of Social Sciences, Random Sampling method was used to select five departments
- Random sampling has been used for the purpose of selecting Research Scholars for administering questionnaires.

4.2 Sample Population

The target population comprises of research scholars of Faculty of Life Sciences and Social Sciences of Aligarh Muslim University Aligarh. Survey method was used to carry out this study. The collection of data from the entire population of research scholars of Faculty of Life Sciences and Social Sciences is huge to be adequately covered in a single study. Therefore, 200 total numbers of questionnaires were administered among research scholars from 5 different departments of Faculty of Life Sciences: Biochemistry, Botany, Museology, Wildlife Sciences and Zoology out of which 150 filled questionnaires were returned back whereas 210 questionnaires were administered among research scholars from 5 departments of Faculty of Social Sciences: Economics, Sociology, Psychology, History and Library and Information.

<table>
<thead>
<tr>
<th>Faculties</th>
<th>Questionnaire Distributed</th>
<th>Questionnaire Received</th>
<th>Response Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life Science</td>
<td>200</td>
<td>150</td>
<td>75</td>
</tr>
<tr>
<td>Social Science</td>
<td>210</td>
<td>202</td>
<td>96.19</td>
</tr>
<tr>
<td>Total</td>
<td>410</td>
<td>352</td>
<td>85.85</td>
</tr>
</tbody>
</table>
Science, out of which 202 filled questionnaires were returned back. Hence, total numbers of 352 filled questionnaires were used for analysis of data (Table 1).

4.3 Data Collection Procedure Adopted
One set of questionnaire was prepared for collecting data from the research scholars of Faculty of Social Sciences and life science, AMU. The questionnaire contained 13 questions of close ended nature. The investigator visited departments of both the faculties in the month of March, 2019 and requested the research scholars to fill in the questionnaire. For this purpose 410 questionnaires, each containing 13 questions were administered among the target population. Out of 410 questionnaires, 210 were distributed among the research scholars of Faculty of Social Sciences, AMU. Total 202 questionnaires were received back; 126 from male and 76 from female research scholars with complete responses. On the other hand 200 questionnaires were assorted among the research scholars from Faculty of Life Sciences, AMU, out of which 150 completely filled questionnaires were returned from 46 males and 104 female research scholars as shown in Table 2. Thus a total of 352 questionnaires were used for analysis of data. The analysis and interpretation of collected data from the research scholars of both faculties i.e. Social Sciences and Life Sciences is presented in the form of tables and graphs as follows:

5. FINDINGS
The whole collected data is presented in the following tables. The most and least exercised option can be checked either by looking at the answers or at its percentage.

5.1 Types of Research Data Generated
Table 3 shows that 61.39 per cent of research scholars of Faculty of Social Sciences mostly generate questionnaires as research data but the number of male research scholar’s response (23.94 %) is low in comparison to female researchers. A good number (60.4 %) of research scholars said that they also generate statistical data during their research. It was also found that 49.5 per cent of research scholars generate survey responses. It is also revealed that films (3.96 %) and laboratory notes (4.95 %) are least generated by them. On the other hand,
Table 4. Research data format

<table>
<thead>
<tr>
<th>Research data format</th>
<th>Faculty of Social Sciences</th>
<th>Faculty of Life Science</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male (%)</td>
<td>Female (%)</td>
</tr>
<tr>
<td>Text documents</td>
<td>94 (74.6)</td>
<td>74 (97.37)</td>
</tr>
<tr>
<td>Structured text/web</td>
<td>26 (20.63)</td>
<td>10 (13.16)</td>
</tr>
<tr>
<td>Spreadsheet</td>
<td>32 (25.4)</td>
<td>38 (50)</td>
</tr>
<tr>
<td>Statistical data</td>
<td>54 (42.86)</td>
<td>52 (68.42)</td>
</tr>
<tr>
<td>Graphics/Images</td>
<td>52 (41.27)</td>
<td>38 (50)</td>
</tr>
<tr>
<td>Audio files</td>
<td>12 (9.52)</td>
<td>6 (7.89)</td>
</tr>
<tr>
<td>Video/Film files</td>
<td>22 (17.46)</td>
<td>8 (10.53)</td>
</tr>
<tr>
<td>Databases</td>
<td>14 (11.11)</td>
<td>22 (28.95)</td>
</tr>
<tr>
<td>Software applications source code or script</td>
<td>6 (4.76)</td>
<td>8 (10.53)</td>
</tr>
<tr>
<td>Configuration data</td>
<td>6 (4.76)</td>
<td>4 (5.26)</td>
</tr>
<tr>
<td>Other</td>
<td>4 (3.17)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>

Multiple answers were permitted

Figure 1. Time period to preserve research data.

a majority of research scholars (93.33 %) of Faculty of Life Sciences generates experimental measurements followed by statistical data (77.33 %) and sample data (54.67 %) during their researches. Only few number of research scholars of Life Sciences generate films (5.33 %) and questionnaires (12 %). It is depicted from the Table 3 that majority of research scholars of Social Sciences generate questionnaires as a research data while only few of them generates laboratory notes whereas in Faculty of Life Sciences, it is exposed that majority of the research scholars generates experimental measurements while only few of them generates films.
5.2 Research Data Format

While analyzing Table 4, it is found that majority of research scholars preserve text documents in both the faculties. Majority (83.17%) of research scholars of Social Science preserve text documents followed by statistical data (52.48%). Whereas only 4.95 per cent of research scholars preserve configuration data during their researches. It is also revealed that female research scholars are 15.16 per cent ahead of male research scholars in preserving text document. While in Life science Faculty 97.33 per cent of total research scholars preserve text document while they preserve only 2.67 per cent of configuration data.

Table 4 reveals that majority of the research scholars are preserving text documents in both the faculties followed by graphical images and statistical data. Very few number of research scholars are preserving configuration data i.e. 4.95 per cent (Social Sciences) and 2.67 per cent (Life Science).

5.3 Time Period for Preservation of Research Data

Analysing the Fig. 1 it is found that a good number of research scholars of Social Science (29.7%) and Life Science (52%) will preserve their research data for their future purposes. Only 13 per cent of Social Science research scholars preserve data for less than a year whereas, only 4 per cent of the research scholars of Faculty of life science preserve their data for less than a year. Figure 1 below enumerates that majority of research scholars will preserve their research data for their future use. The least number of research scholars having their data for less than a year are 13 per cent and 4 per cent in Faculty of Social Sciences and Life Sciences respectively.

5.4 Research Data Management Plan

Figure 2 below depicts the research scholar’s response on use of research data management (RDM) plan, in response to this question, 72.28 per cent of research scholar of Faculty
of Social Sciences replied that they have research data management plan while only 25.74 per cent denied to use it. Similarly, 86.67 per cent research scholars of Life Sciences admitted that they have RDM plan whereas 13.33 per cent do not have any RDM plan.

### 5.5 Reasons for not Having any RDM Plan

Table 5 reveals the reasons because of which research scholars do not use any RDM plan. The major reason behind the denial of the use of RDM Plan is that research scholars do not know how to make it in both the faculties. In Social Sciences Faculty, 16.07 per cent of research scholars do not have time for it. Whereas in faculty of life sciences, 15 per cent of research scholars do not have any RDM plan because they do not know what it is and they also do not have time for it. About 28.57 per cent and 15 per cent of research scholars respectively think that it is not necessary.

It is depicted from the table that majority of the research scholars of faculty of Life Sciences (60%) and Social Sciences (34%) expressed that they do not know how to make it.

### 5.6 Storage of Research Data

Table 6 shows the medium of data storage. Table 6 enumerates that 85.15 per cent of the total research scholars of Social Sciences are using personal storage devices for storing their research data. The percent recorded for the use of Cloud based storage is the lowest in Social Science Faculty which is 4.95 per cent. Hardcopy or printed form got the second highest response which is 48.51 per cent. Similarly, majority (90.67%) of research scholars of Life Sciences also use personal storage devices for storing their research data. The percent recorded for storing data into Cloud based storage is the lowest which is 4 per cent. The other storage media are research data repositories (58.67%), university’s server or repository (25.33%). Whereas the research scholar of both the faculties also mention the use of other storage media.
Table 7. Factors motivating research scholars to share data

<table>
<thead>
<tr>
<th>Reasons</th>
<th>Faculty of social sciences</th>
<th>Faculty of life science</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male (%)</td>
<td>Female (%)</td>
</tr>
<tr>
<td>Contribute to scientific progress</td>
<td>30 (23.81)</td>
<td>44 (57.89)</td>
</tr>
<tr>
<td>Take part in open science</td>
<td>6 (4.76)</td>
<td>12 (15.79)</td>
</tr>
<tr>
<td>Avoid duplication of scientific efforts</td>
<td>16 (12.7)</td>
<td>8 (10.53)</td>
</tr>
<tr>
<td>Required by research funder</td>
<td>10 (7.94)</td>
<td>8 (10.53)</td>
</tr>
<tr>
<td>Required by journal publisher</td>
<td>26 (20.63)</td>
<td>24 (31.58)</td>
</tr>
<tr>
<td>Increase my research citation and visibility</td>
<td>30 (23.81)</td>
<td>24 (31.58)</td>
</tr>
<tr>
<td>Prove confidence in research results</td>
<td>26 (20.63)</td>
<td>26 (34.21)</td>
</tr>
<tr>
<td>Increase transparency of research</td>
<td>28 (22.22)</td>
<td>38 (50)</td>
</tr>
<tr>
<td>Increase my chance of obtaining a grant</td>
<td>6 (4.76)</td>
<td>10 (13.16)</td>
</tr>
</tbody>
</table>

Multiple answers were permitted.

It is clearly depicted from the Table 6 that majority of research scholars of both the faculties use personal storage devices as a medium of storing their research data whereas only few of them use cloud based storage for storing their research data.

5.7 Sharing of Research Data

Figure 3 shows sharing of research data. It is evident from the table that 55.44 per cent of research scholars of Faculty of social sciences share their research data with others, in which, male research scholars are 8.73 per cent ahead of female research scholars in sharing research data. In contrast, research scholars of Life Sciences refused to share their data with others. The percent recorded is 53.33 per cent. In fact, in Life Sciences, male research scholars are 25.12 per cent ahead of female research scholars in not sharing their data with others.

Figure 3 clearly revealed that male researchers of Faculty of Social Sciences are more willing to share their data as comparison to female research scholars whereas this is opposite in the case of Faculty of Life Sciences.

5.8 Reasons for not Sharing Research Data

This study also revealed reasons of not sharing research data which was responded by only those who responded to the previous query with answer ‘NO’. It is clear from the table that majority (42.22 %) of research scholars of Social Sciences do not want to share their research data due to data privacy and confidentiality concerns followed by intellectual property issues(10%) and they don’t have rights to make the data public (10%). Whereas only few number of them do not share due to lack of institutional support (2.22 %), Citation and credit issue (2.22 %), and lack of understanding regarding how to share data (2.22 %). On the other hand, research scholars of Life Sciences responded the same .The percent recorded for data privacy and confidentiality concerns is 35 per cent. Whereas only 1.25 per cent of them stated citation and credit issue. Lack of interest in data sharing (3.75 %), no one will be interested in their data (3.75 %) are some other reasons which is responded by few of them.

5.9 Factors Motivating Research Scholars to Share Data

From Table 7 revealed factors motivating research scholars to share data. It was found that participants who said that they shared their research data with other scholars identified many factors motivating them to do so. It was found that 36.63 per cent of research scholars of Faculty of Social Sciences shared data in order to contribute to scientific progress, 21.33 per cent did so to increase their research citations and visibility and the lowest proportion (4 %) did so to increase chance of obtaining grant.

It is revealed from the Table 7 that a good number of research scholars from both the faculties found the major factor motivating them to share their data is contribution to scientific progress. Whereas the factor which is least responded is increase chance of obtaining grant.

5.10 Methods of sharing research data

Table 8 reveals different methods of sharing research data. It was found that research scholars of Social Science faculty used a number of different data-sharing methods: 30.69 per cent
Table 8. Different methods of sharing research data

<table>
<thead>
<tr>
<th>Methods</th>
<th>Faculty of Social Sciences</th>
<th>Faculty of Life Science</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male (%)</td>
<td>Female (%)</td>
</tr>
<tr>
<td>Post data to personal website</td>
<td>7 (11.11)</td>
<td>1 (2.63)</td>
</tr>
<tr>
<td>Deposit data in open data repositories</td>
<td>3 (4.76)</td>
<td>3 (7.89)</td>
</tr>
<tr>
<td>Deposit data in an institutional data repository service</td>
<td>4 (6.35)</td>
<td>2 (5.26)</td>
</tr>
<tr>
<td>Publish data through academic social networks</td>
<td>15 (23.81)</td>
<td>15 (39.47)</td>
</tr>
<tr>
<td>Publish in a research journal</td>
<td>12 (19.05)</td>
<td>19 (50)</td>
</tr>
<tr>
<td>As supplementary files for the paper on a journal’s website</td>
<td>7 (11.11)</td>
<td>2 (5.26)</td>
</tr>
<tr>
<td>Make data available to peers on request</td>
<td>12 (19.05)</td>
<td>7 (18.42)</td>
</tr>
<tr>
<td>Make data available within a research group</td>
<td>7 (11.11)</td>
<td>11 (28.95)</td>
</tr>
<tr>
<td>Other</td>
<td>0 (0)</td>
<td>1 (2.63)</td>
</tr>
</tbody>
</table>

Multiple answers were permitted.

Figure 4. Main obstacle in sharing research data.

stated that they shared their data by publishing in a research journal; 29.7 per cent through academic social networks; and 18.81 per cent said that they made their data available to peers on request. Depositing data in open data repositories and in an institutional data repository service are the least preferred way of making data electronically available to others (5.94 %), conversely, research scholars of Life Sciences used number of different data-sharing methods: 29.33 per cent through Publish data through academic social networks; 22.67 per cent shared their data by publishing in a research data journal and 24 per cent said that they made their data available to peers on request. Depositing data in open data repositories (4 %) is the least preferred way of sharing data.

This is clearly depicted from Table 8 that a good number of research scholars of Faculty of Social Sciences share their data by publishing in a research data journal (30.69 %). Whereas only few of them deposit data in open data repositories and in an institutional data repository service and they are least
preferred way of making data electronically available to others.
In comparison to male research scholars of Social Sciences, 50
per cent of female research scholars used research data journal
for sharing their data. Research scholars of Faculty of Life
Sciences publish their data through academic social networks.
 Whereas depositing data in open data repositories is the least
preferred way of sharing data.

5.11 Obstacles Preventing the Sharing of Research
Data

Figure 4 indicates the main issues in sharing of research
data.To address challenges, research scholars of both the
faculties were asked to indicate obstacles they encountered in
sharing their research data. The leading obstacle among research
scholars of Social Sciences was data privacy and conﬁdentiality
(37.62 %) followed by the time and effort required to share
data (19.8 %). Technical issues (3.96 %) was opted by very few
of them. Similarly, majority of research scholars of Faculty of
Life Sciences revealed the leading obstacle in sharing research
data i.e. data privacy and conﬁdentiality (30.67 %). Only 5.33%
of research scholars responded to technical issues.

This is clearly depicted from the Fig. 4 that conﬁdentiality
seems to be a common concern among both the research
scholars who share and those who are unwilling to share. In
faculty of Social Sciences, female research scholars are facing
more obstacles in comparison to male research scholars, on the
other hand, in Faculty of Life Sciences, male research scholars
are facing more impediment than female research scholars.

6. SUGGESTIONS

There should be a proper orientation programs for Research
Scholars to make them aware of the importance of RDM plan
at the early stage of their admission. Research scholars must
be aware of beneﬁts of sharing their data and there should be
awareness regarding the factors that can motivate others for
sharing data. University may organise mock classes for data
preservation for research scholars. This includes detail training
sessions for preserving data on various devices and their uses.
Both the faculties must provide sufﬁcient information to their
research scholars regarding method of sharing data, so that by
knowing these, they can share their data in future. Research
scholars suggested that they needed training for research data
management and they also stated that their universities play a
signiﬁcant role in supporting research data management and
sharing. Research scholars also suggested that there should be
a certain policies and guidelines for research data management
and sharing.

7. CONCLUSIONS

The study highlights the perspectives of research scholars
towards research data management and sharing. It has
highlighted that majority of research scholars of Faculty of
Social Sciences as well Life Sciences are using certain RDM plan.
Quite a good percentage of research scholars from both the
faculties preserve their research data for the future. As,
expected, it is found that personal storage devices are widely
used to store their data. As far as sharing of data is concerned,
research scholars of Social Sciences have a positive attitude
towards sharing research data whereas the case is opposite for
research scholars of Life Sciences. Publishing in a data journal
is the preferred method of sharing data in the case of Social
Sciences research scholar whereas publishing data through
academic social networks is the way preferred by research
scholars of Life Sciences. Privacy and conﬁdentiality are found
to be the leading reasons that restrict research scholars from
sharing data.

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Dr. P.M Naushad Ali presently working as professor in the Dept. of Library and Information Science, Aligarh Muslim University has over 20 years of teaching and research experiences. He has several research papers to his credit and has completed six major research projects funded by national funding agencies. He has also delivered many talks in national and international conferences and seminars. He also served as Chairman, department of Library and Information Science, AMU during the period 2009-2012. He is the editor-in-chief of the journal, Journal of Knowledge and Communication Management (JKCM). Prof. Ali is also an active member of national and international professional bodies like International Council of Knowledge Management (ICKM), International Association of Computer Science and Information Technology (IACSIT), American Society for Research (ASR), ISKO, ILA, IASLIC, IATLIS, IASS etc. The present study has been conducted under the supervision and guidance of Prof. Ali and he was involved in suggesting useful improvements to the content of the dissertation, manuscript and put his expertise in preparing the final draft of the paper.