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# Personal knowledge and information management practices of life sciences research students in Pakistan

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## ABSTRACT

*The study investigated personal knowledge and information management (PKIM) practices of life sciences research students and also compared their PKIM practices based on gender and research programme. The study employed survey reserach design in which questionnaire was used to collect data. All MPhil. and PhD. life sciences research students at the University of the Punjab, Lahore, Pakistan were sampled. Altogether 196 questionnaires were distributed and 114 were successfully returned with a response rate of 58 percent. The findings are presented based on the five aspects of PKIM practices of research students: (a) gathering and searching; (b) organising, keeping and securing; (c) selecting and evaluating; and (d) spreading and sharing; and (e) creating, analyzing, and presenting. The findings revealed that research student were exceptionally confident about their PKIM practices. The research students also acclaimed that they were gaining information literacy skills in practising PKIM. The PKIM practices validated in the study may help educators to design training programmes for research students in Pakistan. This study recommends library and information science researchers to investigate PKIM practices on larger scales with different populations as the idea needs more exploration to thoroughly understand the academic research environment.*

**Keywords:** Personal Information Management; Personal Knowledge Management; Information Literacy; Higher education; Information behaviour.

## INTRODUCTION

The term "Personal Knowledge and Information Management" (PKIM) emerged due to the overlapping areas of interest in Personal Information Management (PIM), Personal Knowledge Management (PKM) and information literacy (Świgoń 2014). PKIM is the more comprehensive and appropriate term used compared to PIM and PKM, although these terms are interrelated due to the core concepts of information management and knowledge management. the formal study of pkim has provided a great deal of information concerning how people practise PKIM and the problems they encounter as they do so. People find information with difficulty or sometimes find too much information easily. Regardless, finding information is the first step towards practising PKIM. How do people decide to select or reject an information item? How do they keep this information for later use when they need it? What information organisation strategies do they use that

make sense for them in the lives they lead and want to lead? All these questions involve the practices of PKIM. It is needed not only in dealing with paper documents, electronic materials, web bookmarks, and personal library but also with tacit and explicit knowledge. The idea of an 'individual' or 'unique' way of finding, storing, and working with information in more private spaces is key to the study of PKIM. The rapid changes in information society confront the educational systems with new challenges. Learners need to be more and more responsible for the management of their knowledge and information during the learning process. In the practical field, society demands from the information professionals to work as mobile knowledge workers. Therefore, to survive in a knowledge and information society, learners must learn the required attitude and skills. In this era of information overload, the vast amount of information can hinder human beings' decision-making power by causing stress and anxiety (Pauleen and Gorman 2011). The information literate person is seen to end up a self-ruling learner who can likewise exchange capacities and abilities crosswise over circumstances, with little thought of basic compels.

Research students deal with the bulk of academic-related information and obtain them from various sources as they cope with information flows in their day-to-day lives. Searching, finding, organising, sorting, keeping, and sharing knowledge are essential information practices in their daily lives. Lives are filled with decisions related to the management of information and knowledge, what to acquire, whether and how to organise it, what to discard, what and how to share, and how to find informational materials when they are needed. Research students have to decide, search, find, collect, organise, manage, use, and disseminate information and knowledge. They use different methods for managing information and the number of methods may increase if they have separate computers at work, and home, or if they have multiple mobile devices, such as smartphone, tablet computer or laptop. It is important to study PKIM practices of research students because knowledge and information management competence are necessary in the the stages of information life cycle from acquiring, gathering, searching, organising, using and creating.

Internationally, studies in PKIM are increasingly popular, and have given rise to the need to study PKIM practices in the academic research environment. Different concepts of PKIM remain the focus information behaviour research in Pakistan (Rafique 2014; Warraich, Ali and Yasmeen 2018), however the PKIM of research students in Pakistan has not been examined. A better understanding is needed on how PKIM is being practised in the Pakistani academic research environment among the students. This study, therefore, in the attempt to create awareness about PKIM practices, was set to gauge the PKIM practices of research students in relation to their gender and research experience.

## LITERATURE REVIEW

The concept of PKIM was introduced by Świgoń (2013), where she conceived PIM and PKM as interconnected terms with a slight interaction with information literacy. According to Świgoń and Weber (2014), PKIM is strongly connected with information literacy, nonetheless PIM and PKM can be the subject of separate studies.

PIM is described as the "user's activities when they acquire, organise, retrieve, and process information in their own spaces" (Teevan, Jones and Bederso 2006, p. 68). PIM practices in the working environment have been specifically compelling to many researchers as Barreau (1995) investigated PIM practices of managers, and Pikas (2007) explored the PIM

practices of senior engineers in the research environment. University faculty has also been the subject of PIM studies (Donkor and Nwagwu 2019; Shirazi et al. 2017). Diekema and Olsen (2011) who studied the PIM practices of teachers found that teachers organise information according to their scheme and the scheme may differ if their information packages differ. Researchers have also studied the role of certain information tools in PIM practices. Whittaker, Bellotti, and Gwizdka (2006) and Capra, Khanova, and Ramdeen (2013) examined PIM practices in the context of e-mail programmes. Theses PIM studies on learners show the participants' preference of information in the digital format because of convenience. Capra (2009) surveyed university students' management practices of personal information space and described that e-mail plays the role of common denominator as it helps people to access data from multiple locations on multiple devices. Similarly, Otopah and Dadzie (2013) explored the PIM practices of university students focusing on three major areas of PIM - keeping, organising, finding and re-finding. The important finding of the study was the implication of PIM practices for library services. The authors recommended that libraries should adopt and develop an information literacy framework that focuses on the PIM practices of students. Truyen (2010) who focused on the learning of PIM skills for a better role in society used social software named "information companion" to study the behaviour, attitude and learning interest of students. However, according to Fourie (2011) and Bergman and Whittaker (2016), although people still spend much time and efforts to organise information using digital tools, sometimes their attempts remain unsuccessful.

The learning, growth and development of individuals depend not only on technology but also is associated with knowledge management. Knowledge management refers to the management of organisational knowledge while PKM involves an individual's quest to learn, to work efficiently or to socialize. Martin (2008) highlighted that personal knowledge includes knowledge gained from formal and casual direction, recollections, stories, individual contacts and connections, books read or composed notes, records, and "photos of us or by us". Dorsey (2000) highlighted the PKM core skills, which include retrieving, evaluating, organising, analyzing, presenting, securing and collaborating around information. Wright (2005) mentioned that PKM was essentially an unconscious procedure; members in an organisation did not effectively consider how they were drawing closer and taking care of PKM issues. It is an approach that complements organisational knowledge management by focusing on ways to support productivity of an individual knowledge worker (Efimova 2005). The suspicious value and increasing quantity of knowledge also place big issues to researchers (Al-Omar and Cox 2016; Bundy 2004) as exhaustive information and technology cannot itself make people more informed without a required skills, attitude and capacity to identify, locate, access, retrieve, store and use information progressively (Bundy 2004; Ferrari 2012). Moreover, the productivity of information is unfiltered which makes people suspicious of the accuracy and relevance of the content. Thus, the researchers have ethical and legal challenges in the evaluation, comprehension and use of information (Rafique 2014).

Information literacy is a key element of long-life learning which provides the fabrication of a well-informed community. The term information literacy refers to the broad set of skills and understandings that enables a person to recognise information need, decide which resource to be used, know how to use the resource effectively and evaluate the information they found (Islam and Tsuji 2010). The American Library Association (ALA 1989) emphasises that to be information literate, a person must be able to recognise when information is needed and have the ability to locate, evaluate and use effectively the needed information. Information literacy is fundamentally critical in light of the fact that

people are encompassed by a developing sea of data in all arrangements. All created information is not equivalent: some are definitive, current, solid, but rather some are one-sided, outdated, misdirecting, and false. The measure of data accessible is going to continue expanding as information literacy skills expands and enhances the competencies of individuals beyond the formal classroom environment and gives self-directions to the individuals in their practical life (Rafique 2014). The level of information literacy was found low as information literacy training is not a norm in Pakistan (Ameen and Gorman 2009). Since Ameen and Gorman's (2009) study, many universities in Pakistan have been emphasising the importance of information literacy instruction as a core activity in academic libraries. Riphah International University is one of the universities having a regular information literacy programme which started in 2011 with the aim to equip their campus community with the skills and knowledge to effectively identify, find, evaluate and ethically use information to support academic excellence and lifelong learning (Farooq and Shafi 2013). A few years later, Hamid, Shehzad and Iqbal (2015) evaluated the information literacy programme at Riphah, and found that students in general were quite satisfied with the programme, as it enhanced their searching as well as skills to use library's digital resources. They also showed satisfaction with the time allotted and the frequency of the programme, and the instructors' teaching methods.

The basis of PIKM and origin have been extensivley described in Polish monographs, international journals and at conferences, with the aim to improve functioning of individuals in competitive environment in professional and everyday life (Świgoń 2014). A study was conducted to compare the PIKM behaviour of Polish and German students (Świgoń 2014) where both groups demonstrated similarities and differences among them. Another study by Świgoń (Świgoń and Weber 2014) described the knowledge and information management of students in which the authors highlighted the definitions, differences, dimensions of information and knowledge from the student's perspectives. All aspects that have repercussion on knowledge management and information management are related to one's personal characteristics, the environment and his or her knowledge of information resources. In general, PKIM capabilities are 21st century's abilities; they cover transversal aptitudes, long lasting learning aptitudes and an assortment of academic literacy (such as media literacy, digital literacy, computer literacy), which are all required for cooperation in an information and knowledge-based society, in both private and professional circles of life. There is adequate literature on PIM, PKM and information literacy, but PKIM has not much being explored. Therefore, there is a need to identify the PKIM practices, not only of research students from the sciences but also the students, researchers and practitioners from different scientific fields, in the context of Pakistan.

## METHOD

The study used quantitative method based on survey research design, as it allows flexible and quick data collection from a larger population. For collecting data, a questionnaire developed by Świgoń (2014) was adapted for the study after securing the author permission through e-mail to use the scale. The questionnaire comprised five sections with thirty item statements related to PKIM (Appendix). Every section has six items to assess different aspects of PKIM practices of research students. The necessary modification was made, in the demographic section, according to the need of the study. A pilot study was conducted with a small group of students from one faculty to check the reliability of the questionnaire in the local scenario. Cronbach's alpha coefficient was applied to check the reliability; Cronbach's alpha value was .785 which showed an acceptable level of reliability. No major changes were made in the questionnaire.

The sample for the study was taken from the faculty of life sciences, University of the Punjab, Lahore, Pakistan. University of the Punjab is one of the oldest universities in Pakistan and its faculty of life sciences is the most established in the country, enrolled large number of research students and research-oriented faculty who produced comparatively higher number of scientific publications. The Faculty of Life Sciences, University of the Punjab, comprises eleven departments from which four departments (Department of Botany, Department of Zoology, Institute of Agriculture Sciences, Institute of Biochemistry and Biotechnology) were selected. These four departments enrolled comparatively higher number of full research student (M.Phil. and Ph.D.).

All MPhil. and PhD. Students (N=196) enrolled in the four departments were included in the sample of the study. In this regard, a list of all research students was obtained from these departments and the samples were contacted with a clear indication in survey that their participation was voluntarily. A total of 196 questionnaires were distributed to the samples through their departmental offices, which were passed to the students in their classes, laboratories and departmental libraries. A total of 114 responses were returned, with a response rate of 58 percent of which all was appropriate for analysis. The data were then coded and entered into the Statistical Product and Service Solutions (SPSS) software package for data analysis.

## RESULTS

The study was set to gauge the PKIM practices of research students in relation to their gender and research experience. The descriptive findings are presented based on the five aspects of PKIM practices of research students: (a) gathering and searching; (b) organising, keeping and securing; (c) selecting and evaluating; and (d) spreading and sharing; and (e) creating, analyzing, and presenting. The demographic information of the repondents in the study is provided in Table 1. The gender composition was 35.1 percent male and 64.9 percent female, reflecting that the life sciences discipline is female-dominated. The respondents also contained a larger number of Masters students compared to Doctorate.

Table 1: Demographic Profile of the Respondents

| Demographic Characteristics | | Frequency | Percentage |
|---|---|---|---|
| **Gender** | Male | 40 | 35.1 |
| | Female | 74 | 64.9 |
| **Research programme** | MS/M.Phil. | 70 | 61.4 |
| | Ph.D. | 44 | 38.6 |
| **Departments** | Department of Botany | 15 | 13.2 |
| | Department of Zoology | 28 | 24.6 |
| | Institute of Biochemistry and Biotechnology (IBB) | 29 | 25.4 |
| | Institute of Agriculture Sciences (IAGS) | 42 | 36.8 |

### Knowledge and Information Gathering and Searching

Gathering and searching is a fundamental step in any research process. Searching does not only include finding carefully and thoroughly the needed materials for a particular research topic, but also seeking for peers, colleagues and professionals working on the same topic or subject. Findings in Table 2 indicated that research students perceived their gathering and searching skills as very high (strongly agree and agree) and their self-assessment of

these skills with regard to their area of study is appropriate. More than half of the respondents (67.5%) acknowledged that they had the ability to cope well with the information on a subject that they were interested in (M = 3.66, SD = 1.27). More than half of the respondents (59.7%) confirmed their familiarity with deep web (M = 3.50, SD = 1.04), whose contents are not indexed by standard web search-engines, while 22.8 percent rated it as they don't know. This finding is quite the opposite of Świgoń's study (2013), where a low familiarity was found with deep web. Making notes during classes and lectures seems to be a common habit of information gathering, more than 60 percent of respondents do it systematically (M = 3.57, SD = 1.18). Respondents also reported having a positive attitude towards looking for knowledge and information resources from experts and professionals, other than reading the scientific literature. This shows an important role of tacit form of knowledge and information, which can be transferred through discussions in contrast to explicit knowledge, which is available in the form of scientific literature.

Table 2: Knowledge and Information Gathering and Searching (n=114)

| Item statements | Mean | SD* |
|---|---|---|
| When I search for information, I try to find the people who have knowledge in the field. | 3.84 | 1.12 |
| I cope well with gathering information on subject that interest me. | 3.66 | 1.27 |
| I know a variety of information resources and I can use them, I am familiar with them. | 3.58 | 1.02 |
| I make notes systematically. | 3.57 | 1.18 |
| I know deep web and use of this kind of resources. | 3.50 | 1.04 |
| I prefer learning from experts, professionals than reading the scientific literature. | 3.46 | 1.23 |

Note: 1 = strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = strongly agree

## Knowledge and Information Organising, Keeping and Securing

Findings in Table 3 shows that research students try to keep the encountered information even if they do not need the information at present, in other words they are creating their information collections. They order, classify and sort gathered information to be able to find it later easily (M = 3.69, SD = 1.09). The majority of respondents (58%) acknowledged that they keep information in both forms: paper and electronic. A significant number of respondents (44%) agreed or strongly agreed that they keep information only in the electronic form. Note-taking of spoken information is also a practice among the respondents, with 63.2 percent reported doing it. The results indicated that the research students do not rely on their memory all the time, as they take notes for using and working with them later. However, the respondents in the survey conducted by Morehead et al. (2019) showed a flexible attitude towards note-taking, they elaborated that the decisions of note-taking depends on the nature of the lecture and students do not prefer to take notes during online classes. The last item statement Table 3 deals with securing of information in the form of copies, where 65.8 % respondents have a habit of making and saving copies (M = 3.66, SD = 1.19).

Table 3: Knowledge and Information Organising, Keeping and Securing (n=114)

| Item statements | Mean | SD |
|---|---|---|
| I am trying to order, classify and sort gathered information to be able to find it later easily. | 3.69 | 1.09 |
| Usually I keep encountered information that I do not need now but might be useful in the future. | 3.56 | 1.12 |
| I keep information in both electronic (hard disk, USB drive) and paper forms (notes, binders). | 3.54 | 1.24 |
| I keep information only in electronic form, without any paper copies, hand notes etc. | 3.02 | 1.28 |
| I try to take note spoken information that is interesting for me in order to keep it and add to my collection. | 3.63 | 1.14 |
| I care about making copies of kept materials and saving them. | 3.66 | 1.19 |

Note: 1 = strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = strongly agree

## Knowledge and Information Selecting and Evaluating

To deal with information overload, researchers should develop judgement, evaluation, and problem-solving abilities. Research students in this study in general acknowledged the importance of evaluation skills and selection capabilities to select valuable materials for use (Table 4). More than half of the respondents validated their evaluation skills, however, findings showed that they were not certain about the practice of browsing the materials kept for future use is not done unless there is a real need for that (M =2.96, SD = 1.08). The descriptive statistics for central tendency regarding their behaviour about selection and evaluation revealed some variations. For example, the practice regarding 'browsing the information' kept for future use is not common among the respondents (Mode=2.00).

The respondents did not validate the statement "Even if I use peer-reviewed journals and books, I have problems selecting the articles and publications that are the most important for the subject I am working on". It shows that they have confidence in their skills of finding relevant, quality information. Life sciences research students appreciated the usefulness of the skills and knowledge they are gaining during their studies. They tend to show their self-perceived higher satisfaction about their expertise in evaluating and selecting their needed information. This finding is reflected in the response to the statement "I think that knowledge and skills I am gaining during my studies will be useful in my private and professional life" (M =4.01, SD = 1.14).

Table 4: Knowledge and Information Selecting and Evaluating (n=114)

| Item statements | Mean | SD |
|---|---|---|
| I know how to evaluate information on the Internet and I am able to select valuable information and webpages. | 3.59 | 1.15 |
| In case of large search results, I have no problem with selecting high quality materials. | 3.28 | 1.15 |
| Even if I use peer-reviewed journals and books, I have problems selecting the articles and publications that are the most important for the subject I am working on. | 3.11 | 1.08 |
| Sometimes I browse documents that I am keeping and I throw away unnecessary and redundant materials. | 3.56 | 1.08 |
| I never browse materials I have kept for the future unless I need them currently. | 2.96 | 1.08 |
| I think that knowledge and skills I am gaining during my studies will be useful in my private and professional life. | 4.01 | 1.14 |

Note: 1 = strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = strongly agree

## Knowledge and Information Spreading and Sharing

People share information with others to develop positive relationships and to understand better other people and situations that happen on a daily basis. Table 5 depicts that research students liked to share the information (notes, photocopies, and lectures) and knowledge (spoken information about the topic) they had. Seventy-five respondents claimed that they shared their notes with a classmate in his or her absence (M =3.64, SD = 1.04). This not only confirmed the finding of Świgoń (2013) but also that of Rafique (2015) where it was found that medical students used to share their informational items (photocopies or notes) but in the case of ideas and knowledge, the results were otherwise.

Almost 60 percent respondents were pleased with the ways and methods of teaching and knowledge sharing of their teachers and lecturers. However, 27.2 percent respondents held an opposite view of this. About 64 percent respondents admitted that their teachers were available and willing to provide advice while another 27.2 percent were not satisfied with the availability of their teachers for advice.

Table 5: Knowledge and Information Spreading and Sharing (n=114)

| Item statements | Mean | SD |
|---|---|---|
| I like sharing my lecture notes and other materials (photocopies, data) with other students. | 3.79 | 1.19 |
| I like sharing knowledge (spoken information) related to studying with other students. | 3.81 | 1.12 |
| Other students share their notes with me in case of my absence from classes. | 3.64 | 1.04 |
| Other students share their knowledge (spoken information about our studies) with me. | 3.74 | 1.09 |
| Generally speaking, I am pleased with the ways and methods of teaching and knowledge sharing of my teachers and lecturers. | 3.44 | 1.30 |
| Our academic teachers are available and advise us cordially. | 3.52 | 1.35 |

Note: 1 = strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = strongly agree

## Knowledge and Information Creating, Analysing, and Presenting

Knowledge and information creating, analysing and presenting includes the creation of new knowledge with the analysis of existing knowledge, and presentation of the knowledge in an effective way. Table 6 shows that higher mean values are connected with research work, students' self-assessment of skills and competencies needed for analysing the scientific literature and conducting empirical studies (surveys, experiments). The results revealed that 51.7 percent respondents liked preparing new subjects for classes (in terms of writing tasks and speeches), while 34.2 percent did not like such tasks. About 53.5 percent respondents indicated that they had no problems with searching for and forming new problem statement for their thesis.

Table 6: Knowledge and Information Creating, Analysing, and Presenting (n=114)

| Item statements | Mean | SD |
|---|---|---|
| I like preparing new subject (writing tasks, speeches etc.) for classes. | 3.26 | 1.27 |
| I have no problems with preparing new subjects that are new to me, with deep analysis of the scientific subject literature. | 3.43 | 1.21 |
| I have no problem with searching for and forming new problem statements (analysis of literature, research questions, hypotheses) e.g. for Bachelor or Master's thesis. | 3.28 | 1.17 |
| Conducting empirical studies (surveys, experiments) on my own would not be a problem for me, if that was necessary for my Bachelor/Master' thesis. | 3.46 | 1.21 |
| I am familiar with basic office applications (Microsoft Office, Open Office) needed for type setting a paper. | 3.73 | 1.15 |
| I like public speaking (speaking in classes, conferences) | 3.58 | 1.26 |

Note: 1 = strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = strongly agree

Familiarity with basic office applications used for typesetting attained high mean score (M=3.73, SD=1.15). Research students (62.3%) admitted that they like public speaking in classes and conferences (M=3.58, SD=1.26), unlike what was found in Świgoń's (2013) study on lower mean values for these two items. Overall, the respondents in this study were quite satisfied with their PIK creating, analysing and presenting skills.

## PKIM Practices Based on Gender and Research Programme

Inferential statistics for independent samples t-test were applied to the data in order to identify the difference of PKIM practices among research students based on their gender and research programme. Table 7 depicts the results of t-test for two groups of male and female research students, showing that they have significant difference in terms of mean scores obtained for knowledge organisation skills (p=.007). The results demonstrate that the female research students rated their knowledge organisation skills better than their male counterparts; could be explained that females are generally more organised in terms

of creating and keeping their information collection. The other four PKIM skills do not indicate any significant differences based on gender.

Table 7: T-test based on Gender

| PKIM skills | Male (n=40) | | Female (n =74) | | t | p |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | | |
| Knowledge Gathering | 3.53 | 0.96 | 3.79 | 0.82 | - 1.46 | 0.146 |
| Knowledge Organisation | 3.25 | 0.94 | 3.71 | 0.81 | - 2.75 | 0.007 |
| Knowledge Selection | 3.39 | 0.63 | 3.30 | 0.54 | 0.79 | 0.433 |
| Knowledge Sharing | 3.59 | 0.67 | 3.61 | 0.62 | - 0.19 | 0.853 |
| Knowledge Creating | 3.92 | 0.72 | 3.85 | 0.70 | 0.55 | 0.583 |

Table 8 depicts the results of t-test for two groups of MPhil. and PhD research students, showing that they have significant difference in terms of mean scores obtained for knowledge organisation skills (p=.012). The results demonstrate that the PhD research students rated their knowledge organisation skills better than their MPhil counterparts; could be explained that doctoral students are generally more organised in terms of creating and keeping their research materials. The other four PKIM skills do not indicate any significant differences based on research programme.

Table 8: T-test based on Research Programme

| PKIM skills | MPhil (n =70) | | PhD (n = 44) | | t | p |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | | |
| Knowledge Gathering | 3.63 | 0.84 | 3.81 | 0.94 | -1.04 | 0.300 |
| Knowledge Organisation | 3.38 | 0.80 | 3.81 | 0.94 | -2.54 | 0.012 |
| Knowledge Selection | 3.32 | 0.55 | 3.34 | 0.62 | -1.63 | 0.871 |
| Knowledge Sharing | 3.65 | 0.64 | 3.53 | 0.64 | 1.01 | 0.311 |
| Knowledge Creating | 3.90 | 0.70 | 3.82 | 0.73 | 0.59 | 0.558 |

A one-way Analysis of Variance (ANOVA) was conducted to compare the difference in PKIM practices of the research students based on their disciplines, reflected through the academic departments they were affililated with. A one-way ANOVA revealed that there was a statistically significant difference in research discipline between at least two groups i.e. knowledge gathering [F(3,110) = 3.91, p=0.11] and knowledge organisation [F(3,110) = 11.8, p=.000] (Table 9).

Table 9: Result of ANOVA Test on respondents' department

| PKIM Skills | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Knowledge Gathering | Between Groups | 8.54 | 3 | 2.84 | 3.91 | .011 |
| | Within Group | 80.09 | 110 | .728 | | |
| Knowledge Organisation | Between Groups | 21.5 | 3 | 7.19 | 11.8 | .000 |
| | Within Group | 66.6 | 110 | .606 | | |
| Knowledge Selection | Between Groups | 1.10 | 3 | .369 | 1.10 | .349 |
| | Within Group | 36.66 | 110 | .333 | | |
| Knowledge Sharing | Between Groups | 1.05 | 3 | .350 | .470 | .470 |
| | Within Group | 45.3 | 110 | .412 | | |
| Knowledge Creating | Between Groups | 3 | .163 | .316 | .814 | .814 |
| | Within Group | 110 | .515 | | | |

A Tukey Post Hoc test was performed to further probe one-to-one difference of students' PKIM practices based on the four research disciplines reflected through the academic departments they were affililated with (Table 10). It revealed that for 'knowledge gathering' skills, Botany is statistically significant with Zoology (p=.020), and Zoology is statistically significant with Biochemistry & Biotechnology (p=.046). For 'knowledge organisation' skills, Botany is also statistically significant with Zoology (p=.000), Biochemistry & Biotechnology is statistically significant with Zoology (.000) and Zoology is statistically significant Agricultural Sciences (.000).

Table 10: Multiple Comparisons on PKIM Practices and Research Disciplines (Tukey Post Hoc)

| PKIM skills | (I) Research disciplines | (J) Research disciplines | Mean Difference (I-J) | Std. Error | Sig. | 95% Confidence Interval | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound |
| **Knowledge Gathering** | Botany | Zoology | .811* | .264 | .020 | .098 | 1.52 |
| | | Biochemistry & Biotechnology | .239 | .216 | .688 | -.359 | .838 |
| | | Agricultural Sciences | .253 | .241 | .721 | -.400 | .908 |
| | Zoology | Botany | -.811* | .264 | .020 | -1.52 | -.099 |
| | | Biochemistry & Biotechnology | -.572* | .210 | .046 | -1.13 | -.008 |
| | | Agricultural Sciences | -.557 | .236 | .098 | -1.18 | .069 |
| | Biochemistry & Biotechnology | Botany | -.239 | .216 | .688 | -.839 | .359 |
| | | Zoology | .572* | .210 | .046 | .008 | 1.13 |
| | | Agricultural Sciences | .014 | .181 | 1.00 | -.463 | .492 |
| | Agricultural Sciences | Botany | -.253 | .241 | .721 | -.908 | .400 |
| | | Zoology | .557 | .236 | .098 | -.069 | 1.18 |
| | | Biochemistry & Biotechnology | -.014 | .181 | 1.00 | -.492 | .463 |
| **Knowledge Organisation** | Botany | Zoology | 1.20* | .216 | .000 | .617 | 1.79 |
| | | Biochemistry & Biotechnology | .344 | .178 | .245 | -.151 | .839 |
| | | Agricultural Sciences | .209 | .216 | .767 | -.369 | .789 |
| | Zoology | Botany | -1.20* | .216 | .000 | -1.79 | -.617 |
| | | Biochemistry & Biotechnology | -.857* | .173 | .000 | -1.32 | -.393 |
| | | Agricultural Sciences | -.992* | .211 | .000 | -1.55 | -.434 |
| | Biochemistry & Biotechnology | Botany | -.344 | .178 | .245 | -.839 | .151 |
| | | Zoology | .857* | .173 | .000 | .393 | 1.32 |
| | | Agricultural Sciences | -.134 | .172 | .862 | -.590 | .320 |
| | Agricultural Sciences | Botany | -.209 | .216 | .767 | -.788 | .369 |
| | | Zoology | .128 | .139 | .794 | -.235 | .492 |
| | | Biochemistry & Biotechnology | .134 | .172 | .862 | -.320 | .590 |

*The mean difference is significant at the .05 level.

## DISCUSSION

This aim of the study was to investigate the PKIM practices of research students in Pakistan and to identify any differences of PKIM practices based on gender and research

programme. PKIM skills are divided into five aspects; gathering and searching; organising, keeping and securing; selecting and evaluating; spreading and sharing; and creating, analyzing and presenting. Gathering and searching for relevant information is the first step of any research or assignment by research students and plays an important role in the success of any research project. Pakistani life sciences research students are actively involved in information gathering and searching. They rated their information gathering skills as very good, they claimed that they had knowledge about the information resources and they could use and search the resources at their best. The findings are in direct contrast with previous studies (Bergman and Whittaker 2016; Fourie 2011; Oh 2019; Warraich, Ali and Yasmeen 2018) that reported people spent lots of time, energy and efforts to organise materials. Searching does not only include finding carefully and thoroughly the needed materials for a particular research topic, but also seeking for peers, colleagues and professionals to benefit from their tacit knowledge. The respondents showed a positive attitude towards human resources in tacit knowledge sharing. People in general value the experience, know-how, insight, and expertise with the individual who owns the tacit knowledge, through socialization and interaction in discussion and meetings.

The second aspect of PKIM practice is organising, keeping and securing practices. Research students organised their collections for a future use. Keeping encountered information with an anticipated need was found very common among them. They kept information in electronic as well in print form. They were involved in systematic note-taking, making and saving the notes taken for future use. This is in line with Al-Omar and Cox's (2016) study that found organising informational materials is on-going activity for scholars, and scholars kept materials for future use as a reminder to do something or to use it in future. Likewise, Saeed (2017) found that engineering and information technology students organise their personal information in their personal devices and prefer folder organising by considering the relevance of content.

In the third aspect of PKIM practice, research students validated their evaluation skills required to select high quality materials from the Internet. They keep information they come across while working with anticipated need, however browsing information is not a regular practice. They claimed that the skills would be useful for their private and professional life. They acknowledged having fundamental information literacy, i.e. being able to select and evaluate the needed information out of numerous resources. This finding however requires further investigation, preferably qualitatively, as other local studies on information literacy (Ameen and Gorman 2009; Rafique 2014) argue the lack of such skills among the research students as well as faculty. Life sciences research students are well aware about relevant databases and evaluation strategies and this could be one of the reasons that life sciences research students are producing comparatively more research publications than other disciplines.

With reference to the aspect of spreading and sharing practices, the respondents were of the view that they liked to share academic-related knowledge with their coursemates, and that other students shared their knowledge and ideas with them in return. Respondents were quite satisfied with the teaching methods and knowledge their teachers imparted. They were also found to be satisfied with the availability of teachers whenever they need their guidance. This finding does not only confirm that of Świgoń (2013) but also that of Rafique (2015) where the latter found that medical students shared their photocopied materials or notes, but they were not willing to share their research ideas or experience based knowledge. Other studies (Wei et al. 2012; Yuen and Majid 2007) found that

students had positive attitude towards knowledge sharing, while another (Nisar ul Haq and Haque 2018) confirmed that trust has a significant relationship with knowledge sharing.

The fifth aspect of PKIM is creating, analysing and presenting practice. Research students claimed that preparing for new subjects and deeper analysis of literature was not a problem for them. Specifically, they thought that searching of a reserach problem was not an issue for them to deal with. Familiarity with basic office applications used for typesetting was high among research students. They also expressed liking for public speaking, such as in class or conference presentation. Świgoń's (2013) study found lower mean values for these two items. Overall, the respondents in this study were quite satisfied with their PIK creating, analysing and presenting skills.

To assess the difference between the practices of the research students based on gender and research programme, independent samples t-test was applied. Both groups (male and female) displayed a positive attitude on knowledge organisation, however female research students rated their knowledge organisation skills better than their male counterparts; could be explained that females are generally more organised in terms of creating and keeping their information collection. The fact that life sciences discipline at Punjab University is female-dominated may contribute to this findings. Punjab University Fact Book (2018) reported that that a large number of females enrolled in science-based faculties and the majority of the male enrolled in engineering discipline. In terms of reserach programme, PhD students are comparatively better in knowledge organisation skills than their MPhil colleagues. It is natural that the learning process (from MPhil to PhD) enables the learners to get better understanding, organising and securing information and knowledge resources.

## CONCLUSIONS

People has his or her own attitudes and behaviours in searching, finding, keeping, and organising information, and everyone has individual abilities and capabilities of memorizing. In exploring how research students within life sciences discipline practise PKIM, the current study has focused on five aspects: knowledge gathering, organising, selection, sharing and creating. One obvious limitation is in the restriction to only one university in Pakistan and the number and range of samples included in the study. As such, the findings are inevitably restricted to the range of experiences and conditions by the selected group of research students. Future research may be conducted to a larger population that includes various faculties or research disciplines or at country level to provide more understanding of PKIM practices in Pakistan. For deeper analysis the sections of PIKM should be explored as separate trait also. The role of institutions and faculty in fostering PKIM practices of students should be investigated so that holistic implications can be made. Information professionals and researchers should come forward to investigate the various dimensions of PKIM. PKIM should be a part of the higher education curriculum to enable researchers for effective personal and professional information management. Libraries could come up with their roles in the development and enhancement of PKIM practices for individuals, students or researchers. Libraries may also adopt and develop an information literacy framework to focus on PKIM.

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## APPENDIX

**Questionnaire**

A list of statements related to Personal Information and Knowledge Management is presented below. Please circle the most appropriate answer according to your opinion.

1 – I strongly disagree
2 – I disagree
3 – I do not know
4 – I agree
5 – I absolutely agree

| | | |
|---|---|---|
| **Gathering, searching** | | |
| 1. | I cope well with gathering information on subjects that interest me. | 1 2 3 4 5 |
| 2. | I know a variety of information resources and I can use them, I am familiar with them. | 1 2 3 4 5 |
| 3. | I know the deep Web and how to use this kind of resource. | 1 2 3 4 5 |
| 4. | I make notes systematically. | 1 2 3 4 5 |
| 5. | When I search for information, I try to find the people (teachers, experts, colleagues) who have knowledge in the field. | 1 2 3 4 5 |
| 6. | I prefer learning from experts, professionals than reading the scientific literature. | 1 2 3 4 5 |
| **Organising, keeping, securing** | | |
| 1. | I am trying to order, classify and sort gathered information to be able to find it later easily. | 1 2 3 4 5 |
| 2. | Usually I keep encountered information that I do not need now but might be useful in the future. | 1 2 3 4 5 |
| 3. | I keep information in both electronic (hard disk, USB drive) and paper forms (notes, binders). | 1 2 3 4 5 |
| 4. | I keep information only in electronic form, without any paper copies, hand notes etc. | 1 2 3 4 5 |
| 5. | I try to take note spoken information that is interesting for me in order to keep it and add to my collection. | 1 2 3 4 5 |
| 6. | I care about making copies of kept materials and saving them. | 1 2 3 4 5 |
| **Selecting, evaluating** | | |
| 1. | I know how to evaluate information on the Internet and I am able to select valuable information and webpages. | 1 2 3 4 5 |
| 2. | In case of large search results (thousand of links) I have no problems with selecting high quality materials. | 1 2 3 4 5 |
| 3. | Even if I use peer-reviewed journals and books, I have problems selecting the articles and publications that are the most important for the subject I am working on. | 1 2 3 4 5 |
| 4. | Sometimes I browse documents that I am keeping (both in electronic and paper form) and I throw away unnecessary and redundant materials. | 1 2 3 4 5 |
| 5. | I never browse materials I have kept for the future unless I need them currently. | 1 2 3 4 5 |
| 6. | I think that knowledge and skills I am gaining during my studies will be useful in my private and professional life. | 1 2 3 4 5 |
| **Spreading, sharing** | | |
| 1. | I like sharing my lecture notes and other materials (photocopies, data) with other students. | 1 2 3 4 5 |
| 2. | I like sharing knowledge (spoken information) related to studying with other students. | 1 2 3 4 5 |

| | | |
|---|---|---|
| 3. | Other students share their notes with me in case of my absence from classes. | 1 2 3 4 5 |
| 4. | Other students share their knowledge (spoken information about our studies) with me. | 1 2 3 4 5 |
| 5. | Generally speaking, I am pleased with the ways and methods of teaching and knowledge sharing of my teachers and lecturers. | 1 2 3 4 5 |
| 6. | Our academic teachers are available and advise us cordially. | 1 2 3 4 5 |

| **Creating, analysing and presenting** | | |
|---|---|---|
| 1. | I like preparing new subjects (writing tasks, speeches etc.) for classes. | 1 2 3 4 5 |
| 2. | I have no problems with preparing new subjects that are new to me, with deep analysis of the scientific subject literature. | 1 2 3 4 5 |
| 3. | I have no problems with searching for and forming new problem statements (analysis of literature, research questions, hypotheses) e.g. for Bachelor or Master's thesis. | 1 2 3 4 5 |
| 4. | Conducting empirical studies (surveys, experiments) on my own would not be a problem for me, if that was necessary for my Bachelor/Master's thesis. | 1 2 3 4 5 |
| 5. | I am familiar with basic office applications (like Microsoft Office) needed for typesetting a paper (computer presentation, essay, and bachelor/master's thesis). | 1 2 3 4 5 |
| 6. | I like public speaking (speaking in classes, conferences). | 1 2 3 4 5 |

**DEMOGRAPHIC INFORMATION**

Gender: □ Male □ Female

Research Programme: □ MPhil □ PhD.

Age: □ 25 or Below □ 26-30 □ 31-35 □ 36 -40 □ 40 or above

Research Discipline (Department/Institution): _____