Personal Digital Information Management Practices of Engineering Faculty: Finding, Organizing, and Re-finding Information

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This study aims to investigate the personal digital information practices of engineering faculty members in terms of finding, organizing, keeping, and re-finding information. Quantitative research design based on survey method was used to collect data through structured questionnaire. Simple random sampling technique was applied (random number table) to get response from engineering faculty members. They perceived that their information gathering and finding skills were good and they coped well with gathered information of their interest. Findings revealed that faculty members classified and sorted gathered information to re-find it latter. They also kept information that had potential to be useful in future. Respondents used different ways to re-find their saved information including keywords search, browse through folder structure, access through bookmark, and use of memory. It is noted that browsing information through folder names, and bookmarks were also a common practice among engineering faculty. Findings also revealed that there was statistically significant difference between male and female faculty members' PIM practices. Faculty members perceived that they were skillful in finding information while they were less-proficient in organizing and re-finding information. Thus, they also have to face different types of challenges such as technology obsolescence, assessing future value of information, information fragmentation and memory load in remembering the location of information. The findings of engineering faculty members' PIM practices have significant implications for faculty themselves,

educational technologist, digital library developers, and educational policy makers.

Keywords: Personal information management; Information literacy skills; Faculty members- Pakistan; Academic engineers.

INTRODUCTION

Digital culture in academia and growth of digital contents in the form of websites, databases, repositories, and social media affected the information management practices of faculty members. Especially academicians from engineering and technology have to equip themselves with finding, organizing and re-finding techniques to cope with rapidly changing information landscape in their disciplines. Engineering and technology education encompass lots of responsibilities on faculty for developing professionals, be up-to-date with contemporary society and learn latest development in the field. Technological advancements in data processing has changed the way to search, organize, keep and retrieve information. Now the web has transformed from web of document to web of things. Every single piece of information is accessible and going to be linked for better retrieval in semantic web environment. Yadagiri, and Ramesh (2013) described that Tim Berners-Lee defined the Semantic Web as "a web of data that can be processed directly and indirectly by machines." The proliferation and complexity of digital resources expanded the prospects of information environment. Now faculty members required to be equipped themselves with diverse set of skills and approaches. It facilitates them to find, use, organize and re-find the required information to accomplish desired task and perform their jobs in effective way (Chang, Morales, Chum, Lim & Yuen, 2010). Furthermore, it also has been identified that skills for storing and organizing information are essential in re-finding and re-using data in digital academic culture. Some studies have been conducted in the past regarding PIM practices of academicians (Azadeh, Jadidi & Haghani, 2017; Diekema & Olsen, 2011; Diekema & Olsen, 2014; Jahoda, Hutchins & Galford, 1966; Kearns, Frey, Tomer & Alman, 2014; Kwasnik, 1991). Deng and Feng (2011) described that information finding approaches can be useful in locating or searching it but these tools are unable to support the users in re-locating or re-finding information. The skills for effective information management are essential for faculty members in order to utilize the information to support their teaching and research in *semantic web* environment. Diekema and Olsen (2014) described that teachers have diverse information needs including pedagogical information,

students related and subject related information. Well-managed information may facilitate teachers in information re-finding process and enhance their teaching efficacy.

Personal Information Management (PIM) refers to a person's approaches in searching, obtaining, creating, storing, organizing, preserving, retrieving, using, and distributing the personal data for various purposes. It also deals with approaches to manage the space of personal information (Diekema & Olsen, 2011). According to Jones, Whittaker and Anderson (2012) PIM is the ability to carry out various functions in daily life through information.

The present study would be a valuable addition in the literature of PIM practices. It would be helpful to devise information literacy instruction programs for engineering faculty members in Pakistan especially University of Engineering and Technology (UET) Lahore, that would subsequently improve the quality of teaching as required by Pakistan Engineering Council (PEC).

Objectives of the Study

Following objectives were formulated for current study

1. To investigate PIM practices of engineering faculty members in terms of gathering and finding, organizing and keeping, and re-finding information.
2. To examine the difference between PIM practices of male and female engineering faculty members.
3. To know the challenges faced by engineering faculty members in their personal information management practices.

Research Questions

To meet the objectives of the study, following research questions were developed

1. What kind of personal digital information practices are used by engineering faculty members to manage their information in terms of gathering and finding, organizing and keeping, and re-finding information?
2. What is the difference in PDIM practices of male and female engineering faculty members?
3. What challenges are faced by engineering faculty members in managing their personal digital information practices?

Limitation and Delimitation of the study

Present study only focused on personal digital information practices of engineering faculty members in terms of gathering and finding, organizing, keeping, and re-finding information. However, it didn't emphasize on the construct of 'use and distribution' of information. It also collected data from the faculty members from one of the oldest and leading engineering university that may not be generalized to other universities.

LITERATURE REVIEW

Data is processed into meaningful form that becomes information. Personal information contains the personal records kept by an individual for his/her personal use when required. It may be data referring to an individual e.g. health records, information acquired from digital resources, letters, email, and so forth. PIM asserts on organizing and maintaining personal information collections both in physical/ paper and electronic format. Electronic information can be managed by using electronic devices such as computers and mobile phones. However, this study only focuses on managing faculty members' personal information in digital format. Monograph of Jones (2007) traced the origin of PIM in the form of Vannevar Bush's tool named Memex which was used for collecting, storing and organizing personal information during mid-twentieth century. Bergman (2013) discussed Thomas Malone as originator of PIM research who observed organizing and retrieval behavior of people in physical format. He concluded that some workers efficiently organize paper in relevant files and others put their documents in piles. In this way he discovered the first variable 'order' in PIM research. Bergman (2013) described that order variable is related to organization of PIM. Jones (2010) explained that PIM comprises the practice and study of the activities, a person performs in order to acquire or create, store, organize, maintain, retrieve, use, and distribute the information needed to meet goals and carry out roles and responsibilities.

PIM consisted of three interrelated functions i.e. finding, preserving and re-finding the information (Boardman, 2004; Jones, 2007) and these are related to the need of information. Commonly, individuals initiate to locate, search, find, re-locate, or re-find information to trace the right information which is known as "information need" (Jones, 2010). Researchers enlisted different steps of PIM activities such as 'organizing, finding and keeping information' (Lush, 2014), and "sensing, collecting, organizing, processing, and maintaining" (Hwang, Kettinger & Yi, 2015). Finding information considered first step in PIM and in literature

"collecting" (Hwang, Kettinger, & Yi, 2015) and "searching" have also been used for it.

Malone (1983) identified 'order' variable which has been considered a key variable in PIM literature for three decades (Malone, 1983; Bergman, 2013). Bergman (2013) further categorized PIM related variables as "organization, structure, work process, memory, and retrieval". Organizing information considered important activity of PIM as well-organized information can be retrieved whenever it is needed. There is relationship between organizing and re-finding information. Bergman (2013) also discussed structure variable such as collection size, folder size, folder depth, and folder breadth for PIM. Many other studies elaborated information organizing as digital archiving (Sinn, Kim & Syn, 2017) and organizing information (Lush, 2014; Diekema & Olsen, 2011).

Re-finding information is an important step in PIM as overall purpose of PIM is re-finding already saved information whenever needed. Without organizing the information properly, it becomes difficult to re-find information. The first two activities of PIM (searching and organizing) are imperative and interrelated with re-finding. Many studies have been conducted on re-finding activity with PIM context and literature revealed diverse terms for this activity such as '*keeping found things found*' (Jones, 2010), information retrieval (Bergman, Gradovitch, Bar-Ilan & Beyth 2013; Bergman & Yanai, 2017), information access (Jang, Kim, Shin & Myaeng, 2010), relocate information (Ameen, 2016), and re-finding information (Bergman, 2013; Elsweiler & Ruthven, 2007; Elsweiler, Baillie & Ruthven, 2008; Elsweiler, Baillie & Ruthven, 2011). Navigation and searching has identified as methods for personal information retrieval. Boardman and Sasse (2004) discussed browsing as information retrieval methods and divided browsing into two categories (1) location based in which user can browse through folder structure and (2) orienteering in which user focused on locating specific information.

Plenty of literature is available on PIM practices of faculty members. Diekema and Olsen (2011) carried out a study on PIM practices of teachers and explored through interviews that teachers were well aware of rich information sources and fulfill their information need from digital and print sources. This study concluded that arrangement of information sources in alphabetical order were used as a method of information management. Azadeh, Jadidi, and Haghani (2017) conducted a study in which they explored the PIM practices of faculty members of medical sciences in Tehran. They reported that the level of storing and organizing of information was good among medical faculty members. Overall, their PIM practices

were at good level though, this level was far from the ideal situation due to the lack of time, working pressure and dissociation with PIM activities. Kearns, Frey, Tomer, and Alman, (2014) carried out a survey among teaching faculty members for their online courses. They managed their digital assets using "e-mail, desktop-computers, web-based information, and learning management systems" (p.1). The findings revealed that the faculty dealt with managing their emails, organizing computers stored data pertaining to the field of teaching, and controlling web-based information resources, and manipulating different types of data while teaching online. The study concluded that many of the faculty members were unaware of pervasive tools and techniques that might be used to develop a personalized PIM strategy. Capra (2009) explored the users' PIM behaviors through a questionnaire survey among students, faculty, and other staff. Findings revealed that people used digital devices to transfer data such as USB drive, desktop computers, email, and network storage. The respondents preserved their information searched from the web by making bookmarks, saving in email and creating notes as primary methods for PIM. Studies also have been conducted regarding gender as factor in PIM context (Divya & Sudhier, 2016; Yang, 2015).

Literature established that PIM practices of different user groups including students, teachers and corporate sectors' professionals in different areas of the world and used both qualitative or quantitative research approaches. However, it was found that no comprehensive study has been conducted on PIM practices of engineering faculty members in Pakistan.

METHODOLOGY

Quantitative research approach based on survey method was applied to investigate engineering faculty members' personal digital information management practices. Literature established that quantitative research design was commonly used to explore the knowledge and personal information management practices (Ebiye, 2015; Warraich, Ali, & Yasmeen, 2018; Zhang, 2016).

To meet the objectives of this descriptive study, entire faculty members working at UET Lahore was taken as the population. List of all 24 departments were compiled through UET official website (www.uet.edu.pk) along with the list of 608 faculty members. The population was listed and identified and a representative sample of 340 was selected by using simple random sampling technique. Respondents were selected by using random table. Questionnaire was used as data collection instrument including four sections; first two sections (gathering and

finding, organizing and keeping) have been adopted from Swigon (2013b) and the remaining sections (re-finding already saved information, and challenges in PIM) was developed with the help of literature review. After finalizing first draft of the questionnaire, it was pre-tested among 15 teaching assistants working in different science and technology faculty to gather preliminary data and to refine the survey instrument. Feedback from the pilot study participants was incorporated to improve the instrument. Few complicated words were rephrased, and formatting also improved according to the feedback from participants. Cronbach Alpha (CA) was also measured to check the internal consistency of questionnaire. The result of CA was given according to the four sections of the questionnaire 0.818, 0.832, 0.830, and 0.79 respectively. Final questionnaire was distributed among 340 engineering faculty members for data collection. The personal visits of researchers to the faculty offices played important role to get good response rate. Out of 340 circulated questionnaires, 245 usable filled questionnaires received with 72% response rate.

RESULTS

Demographic information

Out of 245 respondents, 142 (58%) were male and 103 (42%) were female that is representative of the population and majority of the respondents 172 (70%) were up to 35 years of age. Almost half of respondents i.e. 118 (48%) were serving as assistant professor in the university and 97 (40%) as lecturer.

Table 1

Demographic Variable of Participants

Attributes	Attributes' Value	Frequency (%)
Gender	Male	142 (58)
	Female	103 (42)
Age	30 or below	55 (22.4)
	31-35	117 (47.8)
	36-40	55 (22.4)
	41-45	15(6.1)
	46 and above	3 (1.2)
Designation	Lecturer	97 (39.60)
	Assistant professor	118 (48.16)
	Associate professor	18 (7.35)
	Professor	12 (4.89)

Overall, a vast majority of respondents, 215 (88%), have lecturer and assistant professor designation. Only 30 (12%) respondents have the higher ranks such as associate professor and professor. These are also the representatives of the population.

Perception of engineering faculty members and technologists about their PIM practices

This section analyzed the following four constructs '*gathering and finding', 'organizing and keeping', 're-finding information' and 'PIM challenges*' of the study. The results show (Table 2) that the first construct '*gathering and finding'* has six statements with 0.818 Cronbach Alpha. The range of mean value from 3.45 to 4.26 show that respondents agreed with all these six statements (Table 2). The first statement '*I cope well with gathering information on subjects that interest me*' has the highest mean (4.26) on five-point Likert scale with 0.64 Standard Deviation (SD). It shows that teachers were good in searching and retrieving of their relevant information. The low value of SD (0.64) shows that the respondents have similar opinion about this statement. The statement '*I know variety of information resources and I can use them, I am familiar with them*' has second highest mean value (4.20) with 0.517 SD.

Table 2

Gathering and finding information

Statements	Mean	SD
I cope well with gathering information on subjects that interest me	4.26	0.64
I know variety of information resources and I can use them; I am familiar with them	4.20	0.52
I make notes systematically.	3.95	0.793
When I search for information, I try to find the people (experts, colleagues) who have knowledge in the field	3.87	0.89
I know the deep Web and how to use this kind of resource	3.83	0.94
I prefer learning from experts, professionals than reading the scientific literature	3.45	1.19

Scale: 1= Strongly disagree, 2= Disagree, 3= Do not know, 4= Agree, 5= strongly agree

Data shows that respondents are confident enough about their knowledge of relevant sources and they are able to use sources when needed. Respondents perceived that they could make notes, search information from experts and deep web with 3.80 mean values on five-point Likert Scale. However, it is worth noting that respondents *prefer to learn from experts of the field over the reading of*

scientific literature with lowest mean (3.45) among the six statements with 1.19 SD (Table 2).

Table 3 shows that faculty members perceive that they were able to organize and keep gathered information for potential future use. First two statements in '*Organizing and keeping Information*' construct have high mean values 4.09 and 4.06 respectively on five-point Likert Scale. They can classify and sort gathered information to re-find it along with information not needed at present but may have future value. They are also interested to keep information in both electronic and paper forms for future use with 3.61 mean.

Table 3

Organizing and Keeping Information

Statements	Mean	SD
I try to order, classify and sort gathered information to be able to find it latter	4.09	.750
Usually I keep encountered information that I do not need now but might be useful in the future	4.06	.761
I care about making copies of kept materials and saving them.	3.96	.889
I keep information in both digital and paper forms	3.61	1.239
I try to note spoken information that is interesting for me in order to keep it and add to my collection	3.60	1.065
I keep information only in electronic form, with any paper copies, hand notes etc.	3.47	1.081

Scale: 1= Strongly disagree, 2= Disagree, 3= Do not know, 4= Agree, 5= Strongly agree

It also indicates that despite the popularity of digital content, faculty members still prefer print format for teaching and research.

Third construct of PIM is 're-finding information'. It is measured through five statements (Table 4) with 0.830 Cronbach Alpha value. Data shows that respondents can easily search the saved information by using keywords with highest mean value (4.08) and lowest SD (0.73). It represents that respondents are comfortable and used to re-find information through keyword searching and SD value shows the consistency in their responses.

Table 4

Re-finding information

Statements	Mean	SD
I search the saved information by using keywords	4.08	0.731
I browse through folder structure (main folder, sub-folder, files)	3.88	0.966

I access through bookmarks for searching saved information	3.79	0.821
I search the file names remembering tags or labels	3.63	1.066
I use my memory to search the saved information	3.57	1.071

Scale: 1= Strongly disagree, 2= Disagree, 3= Do not know, 4= Agree, 5= Strongly agree

Remaining four statements have less than 4 mean value ranged from 3.88 to 3.57. Overall, all five statements have more than 3.50 mean value that is considered good on five-point Likert scale.

Respondents claim that they browse through folder and files (3.88) followed by access already saved information through bookmarks (3.79). It is noted that faculty members also depend on their memory to re-find already saved information (3.57) and through remembering the names of tags or labels (3.63) respectively. The cumulative mean scores were highest on '*gathering and finding'* (3.93) construct. Its value is closer to 4, which is considered a good value on five point Likert scale (Table 5). '*Organizing and keeping*' and '*re-finding***'** constructs also have good and almost equal values (3.80; 3.79).

Table 5

Cumulative mean scores of PIM constructs

Statistics	Gathering and Finding	Organizing and Keeping	Re-finding
Mean	3.93	3.80	3.79
SD	0.49	0.48	0.49

PIM practices mean score of female respondents (Mean = 3.92, Std. = 0.41) was higher than males (Mean = 3.839, Std. = 0.282). The independent samples t-test found that p=0.083 value is greater than 0.05 and there was a statistically significant difference between male and female faculty members' PIM practices.

Table 6

Difference between male and female academicians regarding their PIM practices

	Male (n=142)		Female (n=103)			
	M	SD	M	SD	T	P
Difference between male and female academicians regarding their PIM practices	3.83	0.28	3.92	0.41	-1.746	0.083

Thus, the female faculty members were better in managing their personal digital information than their male colleagues (Table6). This aspect is interesting and need to be investigated in more depth in different settings. However, it is noted that male faculty members have lower SD value than female that conclude that male teachers have more consistent opinion about their PIM practices than their female colleagues.

Challenges engineering faculty members faced in managing their personal information

To find the answer of third research question, respondents were asked to mention the challenges they have to face in managing their personal information. Data shows that they perceive that technology obsolescence is the common challenge with mean score (3.87). This challenge included different software versions and migration of one file format to another file format. Secondly, they have to face problems in managing their personal information due to huge collection size.

Table 7

Challenges of personal information management

Categories	Mean
Technology obsolescence	3.87
Huge collection size	3.78
Assessing future value of information	3.61
Information fragmentation	3.58
Memory load in remembering files location	3.53

Scale 1= Strongly disagree, 2= Disagree, 3= Do not know, 4= Agree, 5= Strongly agree

This challenge included large number of incoming emails and huge collection of files (3.78). Thirdly, they also have to face challenges in assessing future value of information (3.61) such as setting priority of emails for future use. Memory load in remembering files locations is least important challenge for faculty members such as remembering location of files in computer and digital media (3.53). It is also noted that there was more than 3.5 mean of each challenge which shows that faculty members have opinion on 'agree' and 'strongly agree' on scale regarding PIM challenges.

DISCUSSION AND CONCLUSION

The first category of PIM is 'gathering and finding information'. The teachers perceive that they are good in information gathering and finding skills. Teachers also have knowledge about variety of information sources and their usage. These findings matched with the findings of the Diekema and Olsen (2011) study that teachers were aware with information sources. They thought that the tacit knowledge of their colleagues, professionals and experts was beneficial for them. The second category of PIM practices was '*organizing and keeping*'. Findings revealed that teachers kept relevant information and took notes systematically. They classify and sort gathered information to re-find it latter. They preferred to save their information in electronic format. Literature supports these findings such as the study conducted by Saleem (2015) and found that researchers of life sciences preserve their data for future use in digital folders and assign bookmarks in web browsers. Third section of PIM was '*re-finding information*'. Teachers used different ways to re-find their saved information. Majority of them access and save their materials through keywords. Moreover, browse the information through folder names, bookmarks, file tags, and labels were also a common practice among teachers. Findings regarding 're-finding information' support the previous study (Bergman, Gradovitch, Bar-Ilan & Beyth, 2013). Literature indicated that corporate professionals also use file names and bookmarks to re-find information (Chaudhry & Sughair, 2017). Teachers also claimed that they used their memory to re-find already saved information. Finding regarding the use of memory in re-finding information matched with the study of Otopah and Dadzie (2013) and findings indicated that less numbers of students were dependents on remembrance of files name 'very often' and most of them were not remembered files name. Faculty members were skillful in finding information while they are less-proficient in organizing and re-finding information. Literature revealed (Azadeh, Jadidi & Haghani, 2017) that organizing information is far from ideal situation which negates the findings of this study regarding 'organizing information'. Study also revealed that there was statistically significance difference between male and female faculty members' PIM practices.

Faculty members have to face challenges in managing their personal information. These challenges can be categorized in two major groups such as cognitive psychology related and technological challenges. This study uses the further subdivision of these two categories into five groups such as assessing future value of information, collection size, information fragmentation, technology

obsolescence, and memory load in remembering the location of information (Warraich, Ali & Yasmeen, 2018). Previous literature confirms that information keeping is a challenging task (Marshall, 2007; Sinn, 2017) along with information fragmentation (Marshall, 2007; Sinn 2017; Teevan, Capra & Quiñones, 2007); and difficulty in understanding technology jargons (Sinn, Kim & Syn, 2017).

Based on findings, it is suggested that faculty members need formal training to enhance their information organizing, keeping and re-finding skills. This would lead to efficiency and better teaching practices. It has embedded connotation that to launch an information literacy instruction program would improve faculty members' PIM practices. Administrators and decision makers in higher education should focus on information literacy instructions to enhance the teachers' skills regarding organizing and re-finding information.

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