Personal factors and the role of memory in faculty refinding of stored information

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Received 16 August 2021
Revised 5 December 2021
18 March 2022
22 June 2022
9 September 2022
Accepted 9 September 2022

Abstract

Purpose – The study examined the personal information management (PIM) challenges encountered by faculty in six universities in Ghana, their information refinding experiences and the perceived role of memory. The study tested the hypothesis that faculty PIM performance will significantly differ when the differences in the influence of personal factors (age, gender and rank) on their memory are considered.

Design/methodology/approach – The study was guided by a sample survey design. A questionnaire designed based on themes extracted from earlier interviews was used to collect quantitative data from 235 faculty members from six universities in Ghana. Data analysis was undertaken with a discrete multivariate Generalized Linear Model to investigate how memory intermediates in the relationship between age, gender and rank, and, refinding of stored information.

Findings – The paper identified two subfunctions of refinding (Refinding 1 and Refinding 2) associated with self-confidence in information re-finding, and, memory (Memory 1 and Memory 2), associated with the use of complimentary frames to locate previously found and stored information. There were no significant multivariate effects for gender as a stand-alone variable. Males who were aged less than 39 could refind stored information irrespective of the memory class. Older faculty aged 40–49 who possess Memory 1 and senior lecturers who possess Memory 2 performed well in refinding information. There was a statistically significant effect of age and memory; and rank and memory.

Research limitations/implications – This study was limited to faculty in Ghana, whereas the study itself has implications for demographic differences in PIM.

Practical implications – Identifying how memory mediates the role of personal factors in faculty refinding of stored information will be necessary for the efforts to understand and design systems and technologies for enhancing faculty capacity to find/refind stored information.

Social implications – Understanding how human memory can be augmented by technology is a great PIM strategy, but understanding how human memory and personal factors interplay to affect PIM is more important.

Originality/value – PIM of faculty has been extensively examined in the literature, and limitations of memory has always been identified as a constraint. Human memory has been augmented with technology, although the outcome has been very minimal. This study shows that in addition to technology augmentation, personal factors interplay with human memory to affect PIM. Discrete multivariate Generalized Linear Model

The author acknowledges Ayobola Akintoye for the editorial inputs. The author also acknowledges the anonymous reviewers whose very in-depth understanding of the subject matter and inputs enriched the study.

Library Hi Tech
Emerald Publishing Limited
0737-8831
DOI 10.1108/LHT-08-2021-0268

applied in this study is an innovative way of addressing the challenges of assimilating statistical methodologies in psychosocial disciplines.

Keywords Information management, Personal information management, Human memory PIM, Information technology, Ghana

Paper type Research paper

Introduction

Keeping found things, whether physical or nonphysical, in such a way that they can be easily refound, and refinding them when they are required, poses serious challenges to humans (Jones, 2007a; Copic *et al.*, 2016; Warraich *et al.*, 2018; Donkor, 2019), particularly when the purpose of using the items is either not for a present task, or for yet an undefined task (Krtalic and Ihejirika, 2022). We live in an information-driven world, and humans have always been overwhelmed by the quantity of information they need, use and produce (Tempel *et al.*, 2019). Very significantly, information is a nonphysical resource; its creation, use, storage and, refinding present different challenges from those of physical items. People are constantly creating, collecting, organizing, keeping and disseminating personal information whether at work or home to meet their personal and private, or official knowledge and learning needs (Davis and Zhong, 2017; Donkor and Nwagwu, 2019; Nwagwu and Donkor, 2022).

Personal information is a fundamental part of peoples' everyday lives because personal activities define almost the entire tasks of human beings (Donkor and Nwagwu, 2019). Managing personal information is difficult (Jones, 2007b); it practically amounts to handling a person's world of fantasies and realities. The evidence that people struggle in vain to locate or refind the information they stored previously, is overwhelming and has been documented (Moulaison *et al.*, 2017). Naturally, human memory has been the superstore of found and kept information, information being inseparable from human existence, survival and progress. However, the human capacity to remember is prone to errors, in addition to human behavior of unintentional forgetting of past events such as locations of stored information (Tonegawa *et al.*, 2015).

Also, human beings differ significantly in the way they structure and retrieve the information they had kept in their archives for future use. Despite the explosion in information technologies and their numerous applications to aid memory, human memory remains primary in human information refinding activity (Carlson, 2010). Warraich *et al.* (2018) have suggested, and there is numerous evidence to support the notion, that information technologies themselves require human memories to be fully exploited. Using information technology involves learning skills, and the skills can be forgotten. Clinch *et al.* (2019) opinion suggests that information technologies may impact negatively on human memory.

Addressing the multidisciplinary nature of the subject of information refinding, Butler (2007) deployed the perspectives of memory embedded in neuroscience and psychology to establish the role of memory in information refinding, using the experiences of reference librarians. He, thereafter, invited continued research on how memory discourages growth within the profession. According to him, memory is a complex tool that comprises overlapping systems. Finally, Butler recommended the need to assess memory practices to determine more ways in which memory can contribute to the enhancement of information refinding performance. The utilization of psychological and biological constructs of memory in Butler's study somewhat relates to the roles of personal factors in information refinding performance.

Riegler (2005, p. 89) had stated that "Memory is still a *terra incognita*". Butler (2007, p. 12) described memory as the core of culture and its surrounding ambiance [. . .] what we personally experience, refine, and retain [. . .] "what we inherit from preceding generations, and pass on to the next". This description allows us to view memory, not only as an internal

entity but also as a large and external entity, that is, something that can be extended using technologies, for instance. It is "the core of culture" such as the culture of information creation and storage by high institution faculty. Butler's approach to memory enables us to appreciate memory as something that can be preserved and whose content can be transferred from one person to another, or from one generation to another. It also enables us to avoid limiting the idea of memory to internal processes only as in the definition of Merriam-Webster Dictionary (2005). In line with Butler's description, faculty memory performance will be affected by many factors, including personal factors.

Human memory is not a constant; it is elastic (Namaziandost and Ziafar, 2020). It can expand, and it can shrink, and its performance differs from one person to another (Bergman *et al.*, 2021). Besides using of any techniques that could assist a person to facilitate effective retrieval of information, one of the good encoding techniques is to relate any new information to what someone already knows. This helps one form mental images about the information and find creative approaches to associating the information that one needs to remember with other information or events. For a good retrieval experience, therefore, creating effective cues that link to the encoded information has been recommended by Zhao *et al.* (2021).

Zhao *et al.* (2021) have clarified the need for psychological processing of contextual cues in the effort of individuals to create attention to their stored information resources. The research of Zhao and colleagues was aimed at expanding the research field of contextual cues beyond psychology and neuroscience. They retrieved 494 papers on contextual cues from the Science Citation Index (SCI)/Social Science Citation Index (SSCI) core database of the Web of Science in 1992–2019 and used several bibliometric and sophisticated network analysis tools to identify the primary path of the cues, among others. They confirmed the concept of behavior implementation intentions, that is, there is some implication that researchers would refind information better if they used contextual cues to locate the information they created in the time past.

Personal factors play key roles in how human beings perform in their daily activities, but the concept of personal factors is not clearly defined. Grotkamp *et al.* (2012, p. 1) carried out a study to propose "... a systematic classification of relevant personal factors for describing the background of an individual's life and way of living". They opined that any body function, body structure or activity that affects a person's functioning should be considered as a personal factor, except that body function can be classified otherwise. In their study that was designed within the context of human health, Grotkamp and colleagues provided six classifications of personal factors consisting, altogether, of 72 factors. The classification is general characteristics (e.g. age and gender) and physical factors such as body measurements or handedness. Others are personality/cognitive factors; lifestyle factors (e.g. attitudes, basic skills and behavior patterns); life situation and socioeconomic/sociocultural/socio-demographic factors and health factors.

No studies have ever deployed a large number of personal factors in personal information management (PIM) research; neither does the present study. But the literature on PIM is fraught with discrete examinations of the effects of factors many of which are in Grotkamp and colleagues' classing. Three of the factors have been used in many studies on faculty PIM recently (Donkor and Nwagwu, 2019). They are the general characteristics namely age and gender and a socio-demographic factor namely, rank. In many studies, age is often found to be negatively related to information processing, capacity to learn new things and ability to perform more than one task at a time, as well as shifting focus between different tasks. In a study, Al-Qahtani (2018) concluded that memory is not affected by age as a whole system, but that age can affect certain functions of the memory subcategories.

Gender has also been linked to differences in human memory. Addressing the question of sex differences in cognitive tasks, Asperholm *et al.* (2020) undertook a metaanalysis of a large number of studies to understand the sex differences in episodic memory variance in 535 studies that represented 962,946 individuals. They showed that "...men had larger variances than

women in verbal episodic memory tasks as well as episodic memory tasks having to do with spatial locations. Women, on the other hand, had larger variance than men for tasks involving remembering routes." In an earlier study, Asperholm *et al.* (2020) showed that the mean sex difference in episodic memory heavily depended on the type of material to be remembered.

The influence of rank on faculty PIM behavior was examined in the study by Donkor and Nwagwu (2019), and they showed that rank made a difference in information creation, organization and storage, but the university of affiliation made a difference in information creation and information storage, and not in information organization.

Statement of the problem and objective of the study

The work of university faculty is heavily information-dependent (Nwagwu, 2021). A properly managed information space will enable faculty get their information when they need it, thereby contributing to increased efficiency and improved learning, teaching and research quality. Faculty may have access to information that they do not need for any immediate tasks, while at the same time, the information they would need to address urgent tasks could be misplaced (Kearns *et al.*, 2014). Sometimes, faculty might have forgotten where they stored the information. Sometimes also the information might be locked up in devices such as laptops, smartphones and others. The information might also be located in devices that are located elsewhere, or the files might have been saved using a name that is not heuristic, or in a location that is passworded (Brown and Grossenbacher, 2017).

Evidence abounds that memory issue is a recurring factor in the PIM of faculty, particularly concerning refinding information that was previously found and kept for future use (Balog and Kenter, 2019). However, the influence of personal factors such as gender and age differences, and others, on memory performance of information refinding has not been studied. No study has addressed how personal factors of faculty interact with their memories to influence refinding information they stored sometime in the past. Yet faculty is immersed in both information technology use and tasks that are memory intensive.

To address this observation, this study examined the PIM challenges encountered by faculty in the universities in Ghana, their information refinding experiences and the perceived role of memory. We hypothesize that faculty PIM performance will significantly differ when the differences in the influence of personal factors on memory are considered. Identifying how memory mediates personal factors in refinding stored information will be necessary for the efforts to understand and design systems and technologies for enhancing faculty capacity to find/refind stored information.

Literature review

PIM of faculty

According to Jones (2007a, p. 1) "... personal information management is the study of the activities people perform to acquire or create, store, organize, maintain, retrieve, and use information items such as documents, web pages, and email messages for everyday use to complete tasks and fulfill a person's various roles". Owing to the information intensiveness and significance of the work of faculty, a lot of attention has been paid to faculty PIM (Donkor and Nwagwu, 2019; Oh, 2019). Kearns *et al.* (2014) discuss the applicability of the records continuum model and its generalization as a theoretical framework for understanding the diverse contexts of personal information and their implications for managing the personal information of online faculty. They concluded that filter failure and not necessarily information overload is the major issue in faculty management of information.

Donkor (2019) studied the PIM behavior of the faculty in Ghana. She found that faculty members relied heavily on self/personal print and electronic sources of information, and they

reported poor performance of their memories in refinding stored information. Further, they preferred electronic information sources when compared to print information sources, and also preferred accessing their electronic information sources at home and in the offices due to the comfort and convenience of these physical spaces. The study also revealed that the size of the collection of print information in their personal information space had a correlational effect on refinding print information items.

Oh (2019) investigated and modeled the process of organizing personal information in digital form by information users in an academic environment in the context of everyday life. The study was based on an interview of 18 participants. He tracked and analyzed 143 organization events to model the personal information organization process of the respondents. Their resultant model consists of six stages: "...initiation, identification, temporary categorization, examination/comparison, selection/modification/creation and categorization" (p. 18). In a recent study, Jacques *et al.* (2020) highlighted four activities that were involved in the organization of personal information by faculty namely inclusion, exclusion, apprehension and implementation. They showed that there were differences in the ability of faculty to analyze their information practices. Nwagwu (2021) examined the experiences and encounters of selected social scientists in selected countries in Africa in organizing and finding and refinding the information they had previously stored, using a sample survey that collected data through a qualitative approach. He identified document overload, time, computer literacy and the importance of the information as the core factors influencing the PIM practices of social science faculty.

Zhou *et al.* (2022) investigated the specific measures the social media platforms in China put in place to support PIM, using a survey approach. This goal was addressed by examining how social media platforms understand PIM, and how this understanding affects the PIM support of the technologies they develop. They found that there is a need for improved normative management to address the coexistence of information and management risks. They further observed that user rights are often limited because the platform policies always tend to be more focused on the social media platform. Crucially, they observed that the social media platform policy contents on information management are usually incomplete.

PIM and personal factors

Many studies have addressed the diversity of behavioural factors that affect PIM practices and technologies. The studies addressed issues ranging from the value of digital possessions, filing behaviors, digital legacies, PIM practices and self-efficacy in the use of various information technologies among others. Elsweiler *et al.* (2007) used a diary approach to investigate the everyday memory problems of 25 people from a wide range of backgrounds. They examined the experiences of recovering from memory lapses in respect of retrieving personal information objects. According to them, memory lapses impede users from successfully refinding the information they stored. They found that performance of users when they are refinding objects can be improved by using PIM tools that support human memory. They also suggested that learning about how memory lapses occur in other than computing contexts may facilitate the design of PIM tools and improve people's ability to access and use stored objects.

Fuller *et al.* (2008) explored the role of memory in retrieving data that were stored, with a specific concern on the decay of memory over time. They found a consistent pattern in respect of the memory of the context of the information. Compared with recall performances six months prior, they found that there existed a varied degree of fading of memory compared in different contexts of sources of information. Also, they found that semantic memory decayed faster than episodic contextual information. Further, the respondents were better able to recall data that were self-generated more than passively presented information. They also

found that keywords that the participants used to describe the documents six months prior were not all the time the same six months later. This finding supports the memory model that suggests that as people's knowledge changes, their internal memory contexts become different from what it was when the item was encoded and this makes finding information problematic. The findings of Diamond *et al.* (2020) and Shin *et al.* (2021) support that the performance of memory for an item is better when the retrieval context matches the original learning context.

In a study, Evequoz (2010) has made some findings on the performance of memory in respect of certain types of information. He found that people easily remembered autobiographical information more than other types of information and that using cues associated with contexts facilitates encoding information in the memory. He also found that categorization facilitates encoding information in the memory and helps the recollection of stored information. Finally, they found that even when precise details of information are forgotten, their general meaning and the schemata of the information would often remain. They posited that contextual cues would help in recollecting the location of information.

Drawing on Jones and Teevan's (2008) research on finding and refinding, keeping and organizing, and maintaining, Kearns *et al.* (2014) undertook an exploratory study of the PIM practices of four online faculties who teach online courses. Their study revealed that filter failure was the major challenge that these faculty faced in managing their information. Bergman (2013), realizing the need for more rigorous quantitative studies on PIM to move the concept from its infant stage conducted a study to identify and map variables that characterize and account for the variety of PIM behaviors of individuals. In the study, Bergman conducted 20 semistructured interviews and therefrom compared the behaviors of participants from two extreme poles of the variable's axis. At the end of the study, they found five variables namely organization, structure variables, the work process, memory and retrieval. Bergman's (2013) study expanded the PIM variables from the initial three as identified by Jones and Teevan (2007) to five. In a study on faculty in Ghanaian universities, Donkor (2019) found that the personal factors – gender, age and, rank had a significant relationship with the sources of information used by faculty in creating their personal information. The study also revealed significant differences between age and the types of information often kept by faculty. It was revealed further that most men often kept phone numbers while most women kept bank and credit account numbers.

The purpose of Xie *et al.'s* (2015, p. 1) study was to "... explore graduate students' behaviour and perspectives regarding personal digital document management, as well as insights into the connections between memory and document re-finding." They used semistructured interviews to study 15 graduate students of information and library science. They found that participants considered managing their digital documents very important but they reported having little knowledge about any currently available PIM tools. They used name, subject, storage location, creation time, keyword, document title, document file type, and user's location and recency as descriptors to refind previously stored information. The participants recognized the act of organizing documents as a memory aid and recommended that PIM tools should include support for information organization and simplistic visualizations that can be customized. Examples include using colors to highlight folders or documents.

Otopa and Dadzie (2013) studied the PIM practices of students and their implications for library services at the University of Ghana in Legon. They used a survey approach and administered a questionnaire to 150 students across different study programs. They found that information format, skills, size of the collection, memory and habits influenced their diverse PIM practices. The major drawbacks were inadequate skills, information fragmentation, inappropriate habits and imperfect memory. Their study was based on the PIM framework that focused on keeping, organizing and refinding.

Warraich *et al.* (2018) examined the usefulness of personal digital information management (PDIM) by engineering faculty members using data collected from faculty members of a university engineering faculty. They showed that faculty members understand how useful PDIM practices are for their teaching and learning activities. PDIM improves their performance just as their effective utilization of other resources such as saving their time, energy and money. However, they found that technology obsolescence, the bulkiness of incoming emails, information fragmentation and memory load in remembering the location of the information as major challenges of PDIM.

Nwagwu and Donkor (accepted) further examined how age, gender and rank influence their "... personal information activities behaviors of information creation, information organization, and information storage" (p. 12). They found that "gender made a difference in information organization and information storage while age made a difference in respect of information creation and information organization only" (p. 15). They further found that faculty aged 40–49 years created information the most and that the males stored information more than the females. Also, they found that rank made a difference in information creation, organization and storage. They posited that information system designers and managers implement information management systems without considering the influence of personal variables on human information behaviors.

Ali and Warraich (2020) followed up on Warraich *et al.'s* (2018) study and explored PIM practices of undergraduate university students based on their use of ubiquitous devices such as mobile phones. Their study revealed that undergraduate students use their mobile devices to search, browse and scan information. They made a crucial observation when they stated that the students shared their information with other devices as a strategy for keeping their personal information for future use. Based on sharing as keeping, they developed a model namely "mobile-based personal information keeping." Their study provides software developers of smartphones with the knowledge they require to more efficiently meet people's PIM needs through mobile devices.

What does one learn from the literature reviewed so far? It can be seen that memory, technology and personal factors are among the recurrent factors in faculty refinding of stored information. Personal factors of age and gender relate to subfunctions of memory, and memory relates to refinding of certain types of information. There is sufficient evidence in the literature that human memory varies in human life course; it also differs in capacity and performance across gender, age, interest, motivation and training and other factors (Al-Qahtani, 2018; Asperholm *et al.*, 2020).

Methodology

This paper was extracted from a larger quantitative survey whose instrument was developed from an interview-guided-qualitative process (Donkor, 2019). This study is therefore logically positioned within the mixed methods research paradigm. Mixed methods research could be defined as "research in which the investigator collects and analyses data, integrates the findings, and draws inferences using qualitative and quantitative approaches or methods in a single study" (Tashakkori and Creswell, 2007, p. 4). The precedence of the qualitative method to the quantitative method is the approach that falls within Mackey and Gass's (2016) description of triangulation, despite the terminology having been earlier heavily critiqued by Teddlie and Tashakkori (2009).

The interview schedule in the larger study was unstructured and was administered to six key informants from each of the six universities in Ghana. The issues that guided the interviews were how the faculty create, store and refind personal information and how they use information technologies to manage their personal information. What are the challenges faced by faculty in managing personal information? What storage practices do faculty

employ in keeping information and why? What methods do they use to save interesting or important information? What are the challenges faced by faculty in relying on their memory for information retrieval? The outcome of the interviews was analyzed using NVivo, and common and recurring themes were extracted (Please see Donkor, 2019).

A questionnaire was thereafter designed based on the themes extracted from the interviews, an approach that followed Ricci *et al.* (2019). To increase the validity and reliability of the questions in the questionnaire, the researchers adopted two steps of evaluation of the instrument. The questionnaire was first submitted to two professors of information studies at the University of Ibadan Nigeria and the University of Ghana in Legon who did not participate in the final study. The process leading to the generation of the questions was explained and the scholars were asked to critique the questions and suggest further questions that could guide the study. Their input was mainly concerning the structure and content of the questions, and their adequacy. The questions were edited according to experts' inputs. Secondly, the resulting questionnaire was pretested with ten lecturers from the University of Ghana in Legon, and ten from Central University. These lecturers were also not included in the final sample for data collection. The essence of the pretest was to ensure that the items in the questionnaire were clearly stated and the contents understandable by the respondents. We obtained a Cronbach's alpha coefficient of at least 0.8 for the scales.

The final questionnaire consisted of seven sections namely (1) demographic/personal factors (2) general issues about PIM, including challenges (3) creation of information, (4) organization of information, (5) storage of information, (6) memory and (7) refinding of personal information. This present paper was based on four sections: (1), (2): reduced to challenges only, (6) and (7). The items in the questionnaire that guided this study namely PIM challenges of faculty, the role of memory and finding/refinding, are shown in Table 1. The demographic characteristics and their measurements were – gender: male = 1, female = 2; age (years): < 30 = 1; 30–39 = 2; 40–49 = 3; and > 50 = 4; rank: Professor = 1; and Associate Professor = 2; Senior Lecturer = 3; Lecturer = 4; and Assistant Lecturer = 5 (see Donkor, 2019).

Data were collected from a sample of 235 respondents selected from a population of 2,311 academic staff in six universities in Ghana in 2019. We decided on the sample size for each university using the proportional to size sampling technique to ensure that disparities in

Table 1.
The constructs in the study and their labels

Codes	Challenges of PIM
CP1	Difficulty in classifying or grouping my documents for storage
CP2	Difficulty in naming my files properly for storage
CP3	Difficulty in refinding documents when they are stored
CP4	Difficulty in remembering the names of the files/folders in which I stored documents
	The role of memory in PIM
RM1	My memory is my critical guide in retrieving stored information
RM2	I rely on my memory in retrieving stored documents
RM3	I have a good memory to remember the location of stored documents
RM4	I usually remember the location where I stored an item
RM5	I usually use an event related to the content of my document to guide remembering a document's location
	Finding/Refinding
FR1	I always find my documents
FR2	I always find my information items with ease
FR3	I use attributes I remember to guide my retrieval of an item
FR4	I have difficulty locating my information items
FR5	I never locate my information items

population sizes of the institutions are balanced out. The universities, faculty population and their sample sizes and return rates are shown in Table 2.

Prior permission was sought and obtained from the authorities of the universities, and the researchers thereafter visited the universities from March to November 2018 for questionnaire administration. We distributed 330 copies of the questionnaire, and 235 copies were completed and returned, a response rate of 73%. All the returned questionnaire copies were found usable. Cronbach's alpha test was used to gauge the reliability of each scale and a result was 0.7, adequate for the study. The faculty's perceived challenges of PIM, finding and rerefining experiences, and the role of memory in PIM were examined (Please see Table 1). A five-point Rensis Likert scale guided the measurement for both variables: (1) Strongly disagree, (2) Disagree, (3) Neutral, (4) Agree and (5) Strongly agree.

Data analysis was undertaken with a discrete multivariate Generalized Linear Model. Deploying discrete multivariate analysis is becoming common, happening at a time when psychosocial disciplines are faced with the serious challenges of how to assimilate statistical methodologies that are known to be suited for continuous variables in the natural science disciplines (Fokianos *et al.*, 2022). Multivariate analysis is very suitable for understanding social events that are naturally not amenable to linear reasoning and the approaches of multivariate analysis encompass processes that consider and address the need to linearize the data. By creating opportunities for deploying a large chunk of data at the same time into the system, multivariate analysis enables us to minimize type one error, that is, the chances that we reject a true hypothesis (Agresti, 1990).

To preprocess the data, we conducted a cross-correlation analysis of pairs of the variables of memory, and, finding/refinding stored information. Pairs that have correlation coefficients equal to or higher than 0.6 were assumed to be largely measuring the same construct and were computed to yield a single variable. For memory, Table 3 shows that the correlations of the pairs of variables RM1, RM2, RM3 and RM4 were 0.6 and above, and we, therefore, computed these variables to achieve Memory 1 while RM5 is labeled Memory 2. For finding/refinding, FR1 and FR2 have a correlation coefficient that is less than 0.6 for which reason they are considered cognate and grouped as Refinding 1. Variables FR3, FR4 and FR5 have correlations equal to or higher than 0.6 and were computed to achieve Refinding 2. The data preparation resulted in two factors namely Memory 1 and Memory 2, and two response variables namely Refinding 1 and Refinding 2.

There is a striking visual and somewhat heuristic association between the memory and the refinding of the variable classes we isolated. Memory 1 and Refinding 1 relate to self-confidence in refinding stored information while Memory 2 and Refinding 2 relate to using complementary frames such as attributes to guide recalling the location of stored information. Confidence in one's memory can be achieved by improving the processes through which one encodes information into one's memory. Effective encoding could occur

University	Population	Sample	Questionnaire returned	The response rate
University of Ghana	587	82	60	74
Kwame Nkrumah University of Science and Technology	548	76	47	62
University of Education, Winneba	465	67	50	77
University of Professional Studies, Accra	256	37	29	83
Valley View University	154	24	19	90
Central University	301	44	30	71
Total	*2,311*	*330*	*235*	*73%*

Table 2. Universities, population, samples and return rates

		Memory variables	*1*	*2*	*3*	*4*	*5*
Memory 1	RM1	My memory is my critical guide in retrieving stored information	1				
	RM2	I rely on my memory in retrieving stored documents	*0.652*	1			
	RM3	I have a good memory to remember the location of stored documents	*0.633*	*0.722*	1		
	RM4	I usually remember the location where I stored an item	*0.661*	0.587	*0.644*	1	
Memory 2	RM5	I usually use an event to guide remembering a document's location	0.39	0.255	0.522	0.336	1
Refinding 1	FR1	I always find my documents	1				
	FR2	I always find my information items with ease	0.599	1			
Refinding 2	FR3	I use attributes I remember to guide my retrieval of an item	0.230	0.322	1		
	FR4	I have difficulty locating my information items	0.263	0.212	*0.631*	1	
	FR5	I never locate my information items	0.485	0.011	*0.655*	*0.712*	1

Note(s): *Italic*: Correlation coefficients not less than 0.6

Table 3.
Cross-correlation of the memory variables

when one relates any new information to what one already knows so that mental images about the information can be formed. Further, confidence in refinding stored information could be achieved when one creatively associates the information that one needs to remember with other information or events (Zhao *et al.*, 2021). The variable categories we have isolated relate to two classes of faculty: those that have confidence in the capacity of their memories to remember where they store information and those that rely on complimentary frames to remember locations of stored information.

To address the mediatory role of memory in the study, we merely included memory as a covariate of the factors as shown in Figure 1. Figure 1 illustrates that age, gender and rank relate to the refinding of stored information, but that memory intermediates in this relationship.

Suffice it to state that personal factors encompass more than gender, age and rank, but the scope of the present study did not include other personal factors.

We first presented the demographic characteristics of the respondents, a necessary initial result since the study is concerned with personal factors. The findings that highlight the challenges and the role of memory in refinding previously-stored information were also presented before the multivariate result. Usually, multivariate generalized linear analysis adopts analysis of variance (ANOVA) as a framework that diagnoses the basis for tests of significance; ANOVA achieves this by providing knowledge about the levels of variability within the regression model. It is in this sense that ANOVA was used to diagnose the significance of the multivariate effects (Table 6), that is, which variables will perform well in the regression model. It was also used to carry out tests of between-subjects effects, that is, how much do the subjects differ concerning the dependent variables (Table 7).

Findings

Demographic characteristics of the respondents

Table 4 shows that 68.9% of the respondents were males and 31.1% were females; 50.6% were aged 30–39 while 35.3% were aged 40–49 years. Also, 12.3% were over 50 years while only 1.7% were under 30 years. Senior lecturers constituted 19.1% of the respondents, 59.6% were in the lecturer cadre and 20.0% were in the assistant lecturer cadre. Only three associate professors (1.3%), and no full professor completed the questionnaire.

The result on institutions of affiliation of the respondents shows that 25.5% were from the University of Ghana, 21.3% were from the University of Education, Winneba, and 20.0% were from the Kwame Nkrumah University of Science and Technology. Finally, 12.8% were from Central University while 12.3 and 8.1% were from the University of Professional Studies, and, Valley View University respectively.

PIM challenges of faculty

Table 5 shows that the faculty disagreed with the difficulty of classifying or grouping documents for storage (CP1) (mean = 2.41 and SD = 1.175), as well as the difficulty in

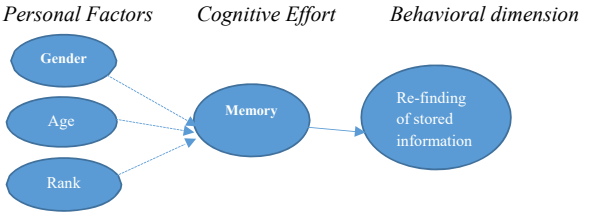

Figure 1. Intermediation of memory in the influence of personal factors on refinding stored information

Variables	Measures	Frequency	Percent
Gender	Male	162	68.9
	Female	73	31.1
	Total	*235*	*100.0*
Age	Below 30	4	1.7
	30–39	119	50.6
	40–49	83	35.3
	Above 50	29	12.3
	Total	*235*	*100.0*
Rank	Associate Professors	3	1.3
	Senior lecturer	45	19.1
	Lecturer	140	59.6
	Assistant lecturer	47	20
	Total	*235*	*100*
University	University of Ghana	60	25.5
	Kwame Nkrumah University of Science and Technology	47	20.0
	University of Professional Studies	29	12.3
	University of Education, Winneba	50	21.3
	Central University	30	12.8
	Valley View University	19	8.1
	Total	*235*	*100.0*

Table 4. Demographic characteristics of the respondents

	PIM challenges	Mean	SD
CP1	Difficulty in classifying or grouping my documents for storage	2.41	1.175
CP2	Difficulty in naming my files properly for storage	2.38	1.280
CP3	Difficulty in refinding documents when they are stored	2.20	1.120
CP4	Difficulty in remembering the names of the files/folders in which I stored documents	2.67	1.231

Note(s): Strongly disagree = 1; Disagree = 2; Neutral = 3; Agree = 4; and Strongly agree = 5

Table 5. PIM challenges

naming/classifying files properly for storage (CP2) (mean = 2.38 and SD = 1.128) and retrieving documents after filing. (CP3), (mean = 2.20 and SD = 1.231). But the faculty were neutral on difficulty remembering the names of the files/folders in which Ione stored documents (mean = 2.67 and SD = 1.231). The faculty did not agree with any of the PIM challenges we listed; faculty PIM challenges could therefore be located elsewhere other than those identified here. But their neutrality on "Difficulty in remembering the names of the files/folders . . ." (CP4) points to some possibility of the effects of limitations of human memory.

Faculty's perceived role of memory in refinding stored personal information

We examined the frequency distribution of the memory and document refinding variables. Figure 2 shows that as large as 65.23% (M = 4.72 and SD = 2.30) of the faculty reported that their memory was critical to their retrieving stored information (RM1) while 23.68% merely agreed. As would be expected, a minority proportion of the respondents reported otherwise. Much fewer members of the faculty (18.96%) strongly agreed that they rely on their memory in retrieving stored documents (RM2); a high proportion (21.2%) agreed, but a larger proportion (41.28%, M = 2.09, SD = 0.008) disagreed with relying on their memory.

Human memory is a natural meta storage facility in the sense that all storage locations, and even memory aids themselves, would require human memory to manage. But does the faculty assess their memory as capable of satisfactorily recalling the locations they stored information (RM3)? Less than half of the respondents (36.45%, M = 4.68, SD = 1.66) and 32.39% strongly agreed and agreed respectively that their memories were good enough; only less than 20% altogether agreed and strongly disagreed, respectively. While human memory is human involuntary preference and first resort to storing information, human memory soon gets filled up such that remembering the items stored therein over time becomes a difficult problem.

Does faculty usually remember the location where they stored an item (RM4)? A relatively low number of faculty (33.13%, M = 3.98, SD = 2.25) strongly agreed while 29.9% agreed; less than 25% disagreed. Finally, only 22.13% (M = 3.22, SD = 1.16) reported that they usually use an event to guide their remembering a document's location (RM5), 19.9% agreed while less than 19% agreed and disagreed, respectively.

Faculty actual refinding of stored information

Figure 3 shows that regarding refinding stored information, only 24.7% strongly agreed that they always refind their stored information (FR1) and 26.96% agreed (M = 3.69,

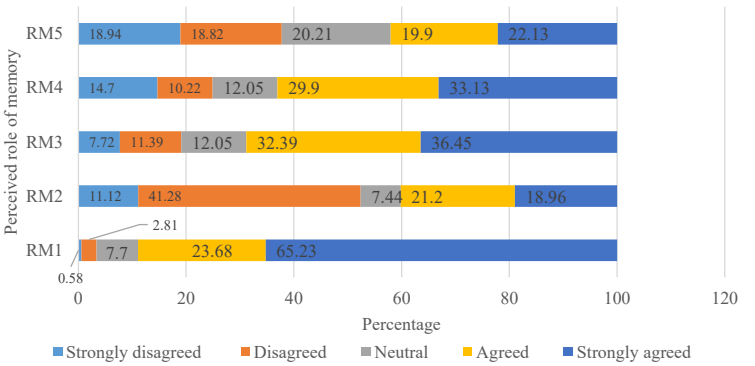

Figure 2.
Faculty perceived role of memory in retrieving stored personal information

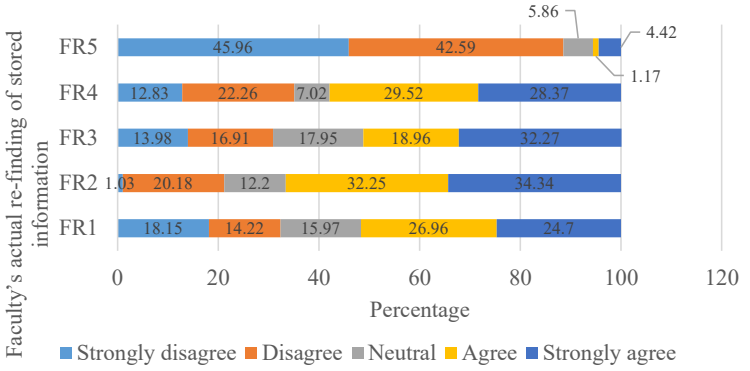

Figure 3.
Faculty's refinding of stored information

SD = 0.23), while 14.22 and 18.15% disagreed and strongly disagreed, respectively. But do they find the stored information with ease (FR2)? As high as 34.34% (M = 4.56, SD = 3.25) strongly agreed that they found the information with ease and 32.25% agreed while 20.18% disagreed and 1.03% strongly disagreed. Storing information in human memory is an involuntary action, and human beings do not take any voluntary charge over the location in their brains where the information would be stored, as in artificial memories.

Using attributes one could remember to guide the retrieval of an item (FR3) was strongly agreed to by 32.27% (M = 4.85 and SD = 5.02) while only 18.96% agreed; 13.98 and 16.91% strongly agreed and agreed respectively while 17.95% were neutral. Psychologists have studied the representational nature of human-object location memory and they showed that multiple frames of reference can be used to encode the spatial relationships among objects. They also identified factors such as dominancy, availability and validity that might determine how these multiple representations may interact to determine human memory performance (Hedenborg *et al.*, 2022).

Having difficulty in locating stored information (FR4) was strongly agreed with by 28.37%, while 29.52% agreed (M = 3.88 and SD = 0.05), 7.02% were neutral while 22.26 and 12.83% disagreed and strongly disagreed, respectively. Recalling the location of stored information involves both biological and psychological factors, and the intersection is not well understood (Namaziandost and Ziafar, 2020). The unfortunate event of never locating stored information items (FR5) was strongly agreed to by 4.42%, 1.17% agreed and 586% were neutral; as high as 42.59 and 45.96% (M = 1.99 and SD = 5.82), respectively disagreed and strongly disagreed that they never remember the locations of their stored information. Although the proportion that falls victim to this category is relatively small, the fact that the nature of the work of faculty consists of regular storage of information in their memories makes the observation worth further investigation.

Testing the hypothesis: faculty PIM performance will significantly differ when the differences in the influence of personal factors on their memory are considered.

We investigated the relationship between three factors namely age, gender, rank and two moderated by Memory 1 and Memory 2, and faculty refinding (Refinding 1 and Refinding 2) of the information they stored for future use. It must be pointed out that enormous output was generated, but it was edited to permit parsimony and easy interpretation; all the factors that made no significant contributions to the dependent variables, or yielded unuseful results were left out of the tables.

Table 6 shows the results of the multivariate effects to determine the variables and combinations of variations of the variables that would perform well compared to all the other possible combinations.

We found significant multivariate effects for Age, Rank and Age*Rank, but there were no significant multivariate effects for Gender, and Age*Gender. However, when gender was paired with Memory 1 or Memory 2, there were significant effects. Memory 1 relates to those faculties that expressed more confidence in their memories. The present implies that although gender has not been strongly established in the literature to be a strong predictor of refinding stored information except when moderated by interest and motivation as well as training, an additional observation is that gender becomes a strong predictor when the consideration is further moderated by the extent of confidence on the ability of one's memory to recall stored information. This same observation holds for gender and Memory 2, which is, using complementary frames to recall the location of stored information.

Between-subjects effects results for the effects of age, rank, gender and memory

Table 7 is the tests of between-subjects effects, the results for between-groups variables – gender, rank and memory. The between-subjects effects test in this study shows how much faculty tends to differ concerning the refinding of previously-stored information. Specifically, for example, would the faculty's refinding of previously-stored information be associated with age?

Again it is remarkable that gender has disappeared in the analysis, indicating that it has no significant effect on Refinding 1 and Refinding 2. Age, rank, Memory 1 and Memory 2 have significant effects on Refinding 1 and Refinding 2. There was a statistically significant interaction between the effects of age on Refinding 1 F (3, 235) = 4.580, $p < 0.05$, and on Refinding 2 F (3, 235) = 9.256, $p < 0.05$. That is, age will explain the refinding behavior of faculty irrespective of whether they reported having the capacity to refind information or rely on complementary frames to achieve refinding. Rank also has a significant effect on Refinding 1 F (2, 235) = 10.498, $p < 0.05$ and on Refinding 2 F (2, 235) = 4.071, $p < 0.05$. Memory 1 also has significant effects on Refinding 1 F (4, 235) = 12.585, $p < 0.05$ and on Refinding 2 F (4,235) = 17.333, $p < 0.05$. Memory 2 also has significant effects on Refinding 1 F (4, 235) = 21.625, $p < 0.05$ and Refinding 2 F (4,235) = 23.569, $p < 0.05$. This result is expected as both Refinding 1 and Refinding 2, on the one hand, and Memory 1 and Memory 2, relate to possessing the capacity to refind or remember locations or relying on complementary frames to achieve the same result, respectively.

Usually, the interpretation and reporting of multiway ANOVA often favors attention to interactions (Anderson, 2003), but a reflection on the result of the single categories is also

Table 6. Significant multivariate effects ($p < 0.001$ level)

Effect	Value	F	Error df	Partial eta squared	Observed power
Age	0.232	7.541	344.000	0.116	1.000
Rank	0.127	5.810	344.000	0.063	0.982
Memory 1	0.514	14.880	344.000	0.257	1.000
Memory 2	0.640	20.244	344.000	0.320	1.000
Age *Rank	0.144	14.374	171.000	0.144	0.999
Age * Memory 1	0.467	13.094	344.000	0.233	1.000
Age * Memory 2	0.179	8.455	344.000	0.090	0.999
Rank * Memory 1	0.221	10.709	344.000	0.111	1.000
Gender * Memory 1	0.065	5.952	171.000	0.065	0.875
Gender * Memory 2	0.146	14.669	171.000	0.146	0.999
Memory 1 * Memory 2	0.680	11.064	344.000	0.340	1.000

Source	Dependent Variable	Type III Sum of Squares	Df	Mean square	F	Partial eta squared	Observed power
Age	Refinding 1	2.244	3	0.748	4.580	0.074	0.882
	Refinding 2	7.026	3	2.342	9.256	0.139	0.996
Rank	Refinding 1	3.429	2	1.714	10.498	0.109	0.988
	Refinding 2	2.060	2	1.030	4.071	0.045	0.718
Memory 1	Refinding 1	8.219	4	2.055	12.582	0.226	1.000
	Refinding 2	17.543	4	4.386	17.333	0.287	1.000
Memory 2	Re-finding 1	14.126	4	3.532	21.625	0.335	1.000
	Refinding 2	23.855	4	5.964	23.569	0.354	1.000
Age * rank	Refinding 1	0.868	1	0.868	5.315	0.030	0.630
	Refinding 2	4.592	1	4.592	18.148	0.095	0.989
Age *	Refinding 1	17.411	4	4.353	26.653	0.383	1.000
Memory 1	Refinding 2	8.760	4	2.190	8.655	0.168	0.999
Age *	Refinding 1	3.493	2	1.746	10.693	0.111	0.989
Memory 2							
Rank *	Refinding 1	2.158	2	1.079	6.608	0.071	0.908
Memory 1	Refinding 2	7.707	2	3.854	15.230	0.150	0.999
Gender *	Refinding 1	1.837	1	1.837	11.252	0.061	0.916
Memory 1							
Gender *	Refinding 1	4.817	1	4.817	29.494	0.146	1.000
Memory 2							
Memory 1*	Refinding 1	21.131	8	2.641	16.174	0.429	1.000
Memory 2	Refinding 2	13.402	8	1.675	6.621	0.235	1.000

Table 7.
Significant between-subjects effects

informative in this study. Table 9 shows Age*Rank predicted Refinding 1 $F(1, 235) = 5.315$, $p < 0.05$, and also Refinding 2 $F(1, 235) = 18.148$, $p < 0.05$ just as Age * Memory 1 did predict Refinding 1 $F(4, 235) = 26.653$, $p < 0.05$ and Refinding 2 $F(4, 235) = 8.655$, $p < 0.05$. Age * Memory 2 also predicted Refinding 1 $F(4, 235) = 10.693$, $p < 0.05$, but not Refinding 2. Age of faculty counts in their refinding performance if they reported relying on events or complementary frames to remember locations of their information. Rank*Memory 1 predicted Refinding 1 $F(2, 235) = 6.608$, $p < 0.05$ and Refinding 2 $F(2, 235) = 15{,}230$, $p < 0.05$. Gender*Memory 1 predicted Refinding 1 $F(1{,}235) = 11.252$, $p < 0.05$, but not Refinding 2. Finally, Memory 1*Memory 2 predicted both Refinding 1 $F(8{,}235) = 16.174$, $p < 0.05$ and Refinding 2 $F(8, 235) = 6.62$, $p < 0.05$. Personal factors vary in their relationship with the capacity to recall local location or refind stored information unaided, or aided.

Multiple regression analysis of effects of age, rank and memory on Refinding 1

Table 8 shows that Assistant Lecturer, i.e. Rank = 5, ($\beta = 2.11$, $p < 0.05$), significantly predicted Refinding 1, where Refinding 1 is a combination of *I always find my documents* (FR1) and *I always find my information items with ease* (FR2). No other variable of Rank predicted Refinding 1. Faculty that reported that their memory was their critical guide in retrieving stored information, and those that relied on their memory in retrieving stored documents, have a good memory to remember the location of stored documents (RM3), and usually remembered the location where they store an item (RM4), that is, Memory 1 *($\beta = 6.422$, $p < 0.05$)* predicted Refinding 1. Those who usually use an event to guide remembering a document's location, or Memory 2 *($\beta = 4.000$, $p < 0.05$)* equally significantly predicted Refinding 1.

None of the categories of age predicted Refinding 1. However, Age = 2, i.e. faculty in the age category 30–39 years, interacted with male (gender = 1), *($\beta = -4.400$ and $p < 0.05$)* to

Table 8.
Multiple regression analysis of effects of age, rank, memory and Refinding 1 (significant parameter estimates)

Parameter	*B*	Std. error	*T*	95% confidence interval Lower bound	Upper bound
Age = 1	7.052	2.522	3.379	12.181	22.604
Age = 2	15.202	1.318	3.632	8.017	15.219
Rank = 5	2.111	1.018	2.074	0.102	4.120
Memory 1	6.422	3.309	1.941	−0.109	12.954
Memory 2	4.000	1.070	3.738	1.888	6.112
Age = 2 * Gender = 1	−4.400	1.255	−3.506	−6.877	−1.923
Age = 1 * Memory 1	−10.722	2.150	−4.987	−14.966	−6.478
Age = 2 * Memory 1	−5.711	2.968	−1.924	−11.570	0.148
Age = 3 * Memory 1	5.122	2.399	2.135	0.386	9.858
Rank = 4 * Memory 1	−3.111	1.062	−2.928	−5.208	−1.014
Rank = 3 * Memory 2	−2.233	1.024	−2.181	−4.255	−0.212
Rank = 4 * Memory 2	−2.111	0.930	−2.270	−3.946	−0.276
Gender = 1 * Memory 1	1.400	0.417	3.354	0.576	2.224
Memory 1 * Memory 2	−5.000	1.011	−4.945	−6.996	−3.004

Table 9.
Multiple regression analysis of effects of age, rank, memory and Refinding 2 (significant parameter estimates)

Parameter	*B*	Std. Error	*T*	95% confidence interval Lower bound	Upper bound	Observed power
Age = 1	17.544	3.526	4.976	10.585	24.504	0.999
Age = 2	16.300	2.410	5.750	9.099	18.612	1.000
Rank = 4	5.744	2.855	2.012	0.110	11.379	0.516
Rank = 5	−4.000	1.267	−3.157	−6.501	−1.499	0.881
Age = 1 *Rank = 4	12.244	3.560	−3.439	−19.272	−5.217	0.928
Age = 2 *Rank = 3	1.856	2.687	−4.040	−16.160	−5.551	0.980
Age = 1 * Memory 1	9.056	2.676	3.384	3.773	14.338	0.920
Age = 2 * Memory 1	14.244	3.695	3.855	6.951	21.538	0.970
Rank = 3 *Gender = 1	8.556	2.988	2.863	2.658	14.453	0.813
Rank = 3 *Memory 1	3.556	1.504	2.364	0.587	6.524	0.652
Gender = 1*Memory 1	−6.444	1.950	−3.305	−10.293	−2.596	0.908

predict Refinding 1. In the same way, Age = 1*Memory 1 predicted Refinding 1 *($\beta = -10.722$ and $p < 0.05$)* just as Age = 2 *Memory 1 did *($\beta = -5.711$ and $p < 0.05$)* and Age = 3*Memory 1 *($\beta = 5.122$ and $p < 0.05$)*. Furthermore, Rank = 4*Memory 1 predicted Refinding 1 *($\beta = -3.111$ and $p < 0.05$)* just as, Rank = 3*Memory 2 *($\beta = -2.233$ and $p < 0.05$),* Rank = 4*Memory 2 *($\beta = 5.122$, $p < 0.05$),* Gender = 1*Memory 1 *($\beta = 1.400$ and $p < 0.05$)* and Memory 1*Memory 2 *($\beta = -5.000$ and $p < 0.05$).*

Multiple regression analysis of effects of age, rank and memory on Refinding 2

Table 9 shows that Age = 1 or those aged less than 30 years significantly predicted Refinding 2 (*($\beta = 17.544 = 0.000$ and $p < 0.05$);* Age = 2 or those aged 30 years–39 years also significantly predicted Refinding 2 (*($\beta = 16.3$ and $p < 0.05$)*. Rank = 4, or faculty at the rank of lecturer predicted Refinding 2 *($\beta = 5.744$ and $p < 0.05$)* while Rank = 1 or faculty at the rank of professor negatively predicted Refinding 2 *($\beta = -4.000$ and $p < 0.05$).*

Faculty at Lecturer rank who were aged less than 30 predicted Refinding 2 *(β* = 12.244 and *$p < 0.05$)* just as senior lecturers aged 40–49 also predicted Refinding 2 *($\beta = 1.856$ and $p < 0.05$)*. Faculty aged less than 30 have Memory 1 characteristics and those that were aged 30–39 also have Memory 1 characteristics predicted Refinding 2 *($\beta = 9.056$ and $p < 0.05$)* and

($\beta = 14.244$ and $p < 0.05$). Also, senior lecturers with Memory 1 characteristics predicted Refinding 2 *($\beta = 3.556$ and $p < 0.05$)* and males that had Memory 1 characteristics predicted Refinding 2 *($\beta = -6.444$* and *$p < 0.05$)*.

Discussion

In this study, the influence of age, gender and rank of faculty on the performance of their memory in refinding of the personal information they previously stored for future use was examined. This study shows that generally, improving one's memory will require improving the processes through which one encodes information into the memory and using techniques that facilitate effective retrieval of the information. Faculty should internalize the practice of relating any new information they encounter and wish to keep to what they already know so that they can form mental images about the information (Al-Qahtani, 2018; Asperholm *et al.*, 2020). This study showed that difficulty in classifying or grouping documents for storage (CP1) is as much a PIM challenge for faculty just as difficulty in naming files properly for storage (CP2). Implicit in PIM research from the outset include the assumptions about persons having rules and methods for acquiring, storing and maintaining information, in addition to PIM being a technology-assisted activity (Bush, 1945; Jones, 2012; Janssen and Singh, 2022). This historical expectation is often queried by the inability of most people to be successful in achieving efficient personal document classification to enable them to manage their personal information.

Despite the faculty reporting that they face challenges relying on their memory to retrieve stored information, a large number of the faculty (65.23%) considered their memory as critical to their refinding of stored information (RM1). More than one-third of the faculty reported that they have good memories and that they usually remember the location where they stored files (RM4), but they do not solely rely on their memories in this regard, and less than 20% usually used an event to guide remembering the location they saved documents.

A discrepancy that is worth highlighting occurred in the faculty's perceived role of memory in refinding stored personal information (in Figure 1), that is, the difference between reporting having a good memory to remember the location of stored documents, and, usually remembering the location where one stored an item. It can be understood that although both variables relate to remembering locations of previously-stored information, remembering the location where one stored an item is tied to human memory while "I usually remember the location where I stored an item" is not. Significant multivariate effects were found for age, rank and memory. There were no significant multivariate effects for gender as a stand-alone variable.

There was a statistically significant effect for age of faculty and Memory 1; rank of faculty and Memory 1, gender resurfaces in combination with Memory 1 and Memory 2, and they had significant effects on Refinding 1 and not on Refinding 2. Finally, Memory 1 and Memory 2 together had significant multivariate effects on refinding. The results of the stand-alone variables conform to the literature (Murman, 2015) whose study showed that age is a key variable in recognizing cues.

Assistant lecturers (rank = 5) are usually younger members of the faculty, and they fall into the category of persons that have occurred in other studies as having the capacity to remember past events. This is the case with the study of Craik and Mcdowd (1992) in their experiment to examine how the performance of young and elderly adults on cued recall and recognition tests in the course of a choice reaction-time task. While this finding is somewhat recurring, it is informative that the finding applies to university faculty – older members of faculty recall locations of stored information resources less than younger members of faculty (Donkor and Nwagwu, 2019). Also, faculty that rely on their memory as their critical guide and have prior consciousness of positive memory performance in respect of refinding stored information and also consider themselves as capable of doing so also performed well in refinding stored information. Those members of faculty who depend on contextual cues to guide their remembrance of stored

resources have a likelihood of always refinding the resources which they previously stored. Age continues to be a predictor of the capacity to refind stored information, faculty younger than 39 refind stored information whereas those older do not (Tables 8 and 9). The observation of faculty of Rank = 5 and Rank = 4 predicting Refinding 1 is also generally understood in the same vein; younger faculty are usually younger in age than those in higher ranks.

This study has not established any very clear differences between male and female genders in respect of refinding information that was previously stored. However, males (gender = 1) who are aged less than 39 and fall into Memory 2 class could refind stored information. Older faculty aged 40–49 (age = 3) who possess Memory 1; senior lecturers (rank = 3) who possess Memory 2 performed well in refinding information. In line with Asperholm *et al.* (2020), Memory 1 and Memory 2 in this study could be considered a type of subfunctions of memory.

Conclusions

This study examined how faculty memory intervenes in the role of personal factors in the re-finding of stored information. Age and rank are strong predictors of information refinding; younger faculty refound stored information more than older ones, but older faculty who have traits of better memory performance, or who possess Memory 2, largely refound information. The memory of older faculty members can be assisted by personal and other variables such as use of cues and contexts. Integrating personal characteristics into memory-aiding tools will improve the retrieval of stored information, age and other, variables notwithstanding. Finally, to a large extent, good memory qualities defied the limitations of age and gender to facilitate the refinding of previously-stored information.

Researchers have deployed many theories to address PIM, but the expectation of the emergence of a theory of PIM has not happened. This present study unveils the need to unpack the concept of the role of memory in respect of PIM by further examining the nature and role of personal factors, and how they interact with memory to influence PIM behaviors. In respect of the role of memory in the refinding of stored information, we identified two classes of memories namely Memory 1, associated with confidence in refinding stored information, and Memory 2, which relates to being assisted by complementary frames to refind stored information. Further studies are required to examine the nature of these memory classes; studies are also required to identify and differentiate between the characteristics of faculty who rely on their memory and those that utilize complementary frames. The findings in this present study are supported by Asperholm *et al.* (2020) which suggest clearly that memory should not often be considered as a single whole; rather, it can be decomposed into various subcategories for better understanding of its roles in information refinding performance.

Nwagwu (2021) has found information literacy to be a major factor in PIM efficiency. His opinions queried what is being taught about PIM, observing that it is unclear how research on PIM has affected pedagogy. This present study adds to the need to include the memory subcategories as some of the issues that could guide information literacy. Nwagwu and Williams (2022) further observed that the variety of information technologies for PIM appears numerous and that each emerging information technology tool finds PIM a veritable testing ground. PIM technology designers could start narrowing the variety of options by incorporating personal factors and memory types.

Limitations of the study and future direction

Human memory remains one of the central references in PIM research – personal factors, context and information technology that dominate PIM solutions are also memory-valuated constructs. In this study, the researchers merely relied on a statistical analysis tool to split

memory into two classes. However, the outcome of this event only demonstrates that attention should be paid to how better to deploy the construct of memory to improve the refinding of the stored information and further improve our understanding of PIM performance. Age and gender affect certain subfunctions of memory, and refinding of certain types of information (Asperholm *et al.*, 2020). The present study raises the need to identify memory subfunction, and to examine the relationship between these subfunctions and various types of information refinding.

Furthermore, personal factors in this study were limited to three constructs: age, gender and rank; but other personal factors such as the field of the study, training and personal motivation, among others, could offer some insights into how memory might be deployed in PIM research. Besides personal factors, environmental and other factors could also affect human memory performance in respect of refinding stored information. Also, the terms Memory 1 and Memory 2 were not identified with any specific terminology, a challenge that is permissible in a developing study, and which could be taken up in further research. Finally, studies on memory tend to be guided mainly by experimental research designs, but these kinds of research designs are not common in PIM research. They may need to be deployed to expand our knowledge about the relationship between faculty memory and their PIM performance.

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