

University of Strathclyde
Department of computer and information Sciences



**How Do Academics Keep Up to Date?: A Case Study at
the University of Strathclyde**

By

Nouf Alshareef

Department of Computer and Information Sciences University of Strathclyde
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Declaration

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Signed:

A handwritten signature in blue ink, consisting of a series of fluid, connected strokes that form a cursive name.

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Abstract

Technological advances are changing the academic environment; for example, increasingly available and varied electronic information, amounting to an information explosion, affects academics' information-seeking behaviour (ISB) as they face information overload. Academic staff and PhD students face particular challenges in identifying and locating the most relevant information among a vast and rapidly increasing body of literature as they strive to keep up to date (KUTD) with significant developments. This research seeks to understand how they do so, in order to provide better KUTD strategies and user-matched KUTD services.

This mixed-method case study of Strathclyde University therefore investigates KUTD as both services and behaviour, first by analysing the university library website and interviewing a librarian (service provider) to examine the provision, support and promotion of KUTD services, then by using a questionnaire and interviews to collect information from staff and PhD students (benefit owners), exploring user behaviour, approaches and commonly used KUTD methods and tools.

The research contributes novelty in being the first to investigate KUTD as both services and behaviour among staff and PhD students. Its originality extends to investigating both high-level groups of KUTD methods and individual (low-level) methods within them. It identifies the most used methods, the demographic factors (age, gender and experience) affecting usage and diverse motivations for their use. It examines the university's KUTD service provision and recommends ways to improve searching skills and strategies via training courses and personalizing services or customizing tools, thus making a useful contribution regarding scientific information and research, specifically on academic library policies.

Participations

1. SICSA PhD Conference 2015 presentation

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List of Abbreviations

AJ	-	Academic Journals
AT	-	Academic Tools
AS	-	Alert Services
CCA	-	Canonical correlation analysis
CS	-	Citation Services
CA	-	Current Awareness
CAS	-	Current Awareness Services
FA	-	Factor Analysis
GS	-	Google Scholar
HASS	-	Humanities and Social Science
IB	-	Information Behaviour
ISB	-	Information Seeking Behaviour
ISP	-	Information Seeking Process
IT	-	Information technology
KUTD	-	Keep up to date
LIS	-	Library and Information Studies
LS	-	Library Services
MM	-	Multimedia
OA	-	Open Access
OS	-	Other Sources
PE	-	People and Event
PCA	-	Principal component Analysis
PFA	-	Principal Factor Analysis
RDP	-	Research and Development Programme
RG	-	Research Gate
RSS	-	Rich Site Summary and Really Simple Syndication
SDI	-	Selective Dissemination of Information'
SM	-	Social Media
TOCs	-	Table of contents
ITIL	-	The Information Technology Infrastructure Library
WoS	-	Web of Sciences

Chapter 1: Introduction

1.1 Introduction

This chapter explains the background to the current research, detailing the problem statement the motivations of the research and the thesis structure.

The research is concerned with individual academics, members of staff and PhD students, and with the different methods used within their research environments to keep them abreast of the latest developments in their respective fields. In exploring how they KUTD, it seeks to determine the various behaviours of staff and PhD students, the strategies adopted, the methods and tools being used, whether online or offline, and the reasons for using them. It thus aims to reach a better understanding of individual needs which will ultimately help users to combine methods and tools in ways that suit their preferences and their academic undertakings, taking account of research workflow and other factors influencing their KUTD activity. It also aims to facilitate the University library's provision of better KUTD services to individual users.

The findings of the research will then be used to design better services and support good provision for staff and PhD students to follow in order to KUTD. It is believed that the consequent improvements to academic KUTD activity will in turn affect the wider academic and non-academic society positively. In pursuit of this ultimate goal, it will be necessary to improve both the training and the practice of staff and PhD students so that their enhanced KUTD behaviour will reflect the latest developments.

In considering the aims and objectives of the current research, there is a set of research questions that need to be answered as follows:

- What methods are most frequently used to KUTD?
- Is there any association between age, gender, experience, faculty or position and differences in using KUTD methods?
- Are there any obstacles and difficulties facing participants to KUTD?
- What are the factors or motivations behind the usage of particular methods?

- What is the role of the library in providing KUTD services?

To achieve these objectives, the researcher has undertaken a case study, using mixed methods to investigate KUTD services and practice at Strathclyde University and thus to answer the research questions. The specific methods used are an analysis of the university library website, an extended interview with a senior librarian, a questionnaire and interviews with individual members of staff and PhD students. Each of these methods will address a set of questions that will help to answer the main research questions and these various questions are specified in the respective chapters.

1.2 Statement of the Problem

Recent developments in information technology (IT) have resulted in electronic materials being created, published and disseminated in increasing quantities, producing a vast and ever-growing body of literature (Bjork et al., 2009; Khabsa and Giles, 2014). Academic information now comes from a great number of sources, locations and individuals, via a multiplicity of communication channels including databases, online journals, social and professional networks, apps and e-books. IT advances have multiplied the diversity of data formats to include full text, video, audio files and images of many kinds (Case, 2012). At the same time, information and communication technology (ICT) has developed to the point where it is ever easier for individuals in academic environments to gain access to the range of resources listed above and to interact with one another (Ranjan, 2008).

This steady progress in IT and ICT has had pedagogical consequences, facilitating developments in the fields of teaching, learning and research. Meanwhile, individual's information behaviour has become more closely integrated with the environment and subject to fewer restrictions related to the availability of resources and access to institutions (Case, 2012). Research in information sciences has changed its nature to become centred on individuals rather than on institutions, reflecting a growing concern with the methods of searching for and finding information that individuals have available to them (Pettigrew, Fidel, and Bruce, 2001; Davies and Williams, 2013).

This adoption of a user-centred paradigm does not limit the concern of this research to an exploration of purely individual practices; instead, it views these practices as series of processes that vary from one situation or context to another (Wilson and Allen, 1999; Pontis et al., 2016). The expectation is that an enhanced understanding of the information behaviour

of individuals will lead to the provision of services that better fulfil individual needs and to the design of improved tools, thus making it easier for people to exercise control over their manipulation of the plethora of information resources.

The need to KUTD is significantly influenced by constant changes to the academic environment, exposing universities to a number of challenges including the transformation from a system where individuals worked largely in isolation to one of mass education, in parallel with increasingly rapid advances in technology (Gappa et al., 2007), heavier academic workloads and continuous assessment of quality (Kyvik, 2013). Research funding is increasingly subject to market forces, obliging academic researchers to present more innovative ideas (Kyvik, 2013). Members of university staff must at the same time fulfil a range of responsibilities in research and teaching in order to further their careers. Given the growing pressure on staff/student ratios and the fact that academic staff are increasingly expected to be available for individual consultation, it is unsurprising that academics feel under an ever-greater weight of work (Kyvik, 2013). In addition to these workload considerations, academic staff and PhD students alike find it difficult to KUTD in their specialisms as they seek access to high quality material within the rapidly swelling body of information and data appearing every day. The variety of formats in which information is supplied and the busy nature of academic life make it difficult for staff members and PhD students to evaluate all available material and can cause information overload. The sheer number of information sources makes it essential to identify ways in which the KUTD facilities available to academic users can be more efficiently controlled and managed (Pontis et al., 2015).

In short, the current deluge of information can be well managed only if users, whether members of staff or PhD students, are given the tools, services and KUTD strategies they need to find the information they need and to exploit it. There is a need to focus more sharply on individual needs, for instance through personalised services which provide appropriate types of information in relevant formats via particular channels. The paucity of extant KUTD studies leaves academics in urgent need of further support from the provision of tools to filter information and control search activities, making them relevant to the needs of individuals and mirroring the advantages of conversing with colleagues and peers, rather than extending the range of online search tools (Adams and Blandford, 2005).

1.3 Motivations of the Research

The current research focuses on KUTD as activities performed by individuals and as services provided by the university library. Therefore, it can be classified under the broad field of information science, which includes user studies, a subfield to which it can be said to contribute in various areas. These include information-seeking behaviour (ISB), where individuals interact with information systems and their environment (Wilson, 2000b). User studies also investigate the full range of behaviours that users undertake as they search for information. The second subfield addressed by the present research is library and information sciences (LIS), being concerned with determining how the academic library should facilitate information seeking and provide the services that its users need.

This section discusses the various motivations for conducting the current research, by reflecting on the limitations identified in the existing literature and how the researcher has attempted to tackle and overcome them.

The literature review begins by focusing on the online ISB of individuals, then considers how to identify factors that may affect that behaviour. Some studies have shown that demographic factors such as gender, age, faculty and experience can be important determinants of ISB (Maghferat and Stock, 2010; Singer et al., 2012). However, studies of age as a factor tend to have inconsistent findings and to have been conducted in non-academic environments (Jansen and Solomon, 2010; Strítešký et al., 2016), indicating a need for additional investigations (Herrera, 2016; Stone and Collins, 2013). With regard to discipline, the literature mainly considers the ISB of academic staff in single disciplines and most studies have examined the behaviour either of PhD students (e.g. Ganaie and Khazer, 2014; Korobili et al., 2011; Spezi, 2016), or of staff, but not both. Other factors such as age and experience have not been discussed comprehensively in the literature, so further research is needed.

In addition, most studies of academics' ISB have used questionnaires to collect data, with mixed methods tending to be used more in studies of workplace environments.

As to LIS, many studies have explored the role of academic libraries in supporting teaching and serving the research needs of both academic staff and students. Most of these have concentrated on user expectations, service quality and user satisfaction, which academic libraries should address in order to meet their users' needs (Pedramnia et al., 2012). However, they have focused more on library resources used than on the need for library services and

because users are at the core of all library activities and services, it is important to understand their experience of the various services, which can help to measure their satisfaction with the library and the quality of its services (Dahan et al., 2016).

Advances in technology have transformed the role of academic libraries, making it essential for them to recognise and understand their users' continually changing needs. The literature reports a number of studies concerned with identifying these needs and ways of making users aware of the relevant services (e.g. Adeniran, 2011; Raju et al., 2018; Korobili et al., 2011; Khan and Bhatti, 2012), but the existing literature does not discuss in detail the different library services or how library roles have changed over time. Studies in the electronic age are more concerned with data management or data repositories (e.g. Corrall et al., 2013; Peters and Dryden, 2011) and with other topics discussed in more detail in the literature review. Another limitation of the literature is that it discusses library services generally and does not consider specific services such as KUTD in a contemporary context, focusing instead on KUTD in the past. Most studies of library services also appraise the bigger picture (Auckland, 2012; Oakleaf, 2010), rather than examining in greater depth, for example, possible relationships between service usage and demographic factors. While many studies have identified difficulties for staff and PhD students in using academic libraries' websites (e.g. Kress et al., 2011; Chaurasia and Chaurasia, 2012; Ganaie and Rather, 2014), the literature has very little on promoting or designing services, nor on how to design a website to support service provision.

In summary, two broad gaps have been identified in the literature. Previous studies have mostly treated KUTD as an aspect of ISB, rather than from the perspective of both behaviour and services. They have also tended to be general in scope and recent studies have not investigated KUTD behaviour among staff and PhD students. The current study seeks to fill these gaps, in particular by investigating which methods these groups tend to use and their reasons for doing so. It evaluates the effects on KUTD behaviour of factors such as gender, age, faculty and experience, more specifically by identifying all possible KUTD methods and tools and categorising them into groups, then determining how the different factors affect the usage of the individual methods and higher-level groups. This research is further distinct from previous studies, which either considered academics or PhD students, but not both, or else were limited to a particular field, in that it investigates the KUTD behaviour of both staff and students in several disciplines. Another point of difference is that the current research focuses on a UK university which has not previously been studied in this area.

Methodologically, the study uses a combination of quantitative and qualitative methods to collect more in-depth data, with the potential to offer a more detailed understanding of the phenomenon of interest.

With regard to KUTD services, the current research seeks to fill a substantial gap in the literature by investigating how the library should promote, support, provide and manage KUTD services, via diverse online and offline channels as well as the library website. By examining demographic differences in usage, it seeks a better understanding of individual needs, while also considering the librarian's point of view on providing services and how that can play a role in activating the services. In addition, as detailed in the literature review, the present research investigates all possible modes, approaches and behaviours open to KUTD service providers.

The gaps identified above reveal a need to consider simultaneously the library as a service provider and user needs, to ensure the delivery of the right information to the right user; this is what the current research does, by investigating the library and its website and by eliciting data from a librarian and a broad range of users, in order to determine how KUTD services can be better designed.

A more personal motivation for conducting this research is the researcher's background. Having obtained a bachelor's degree in Library and Information Sciences and a master's in Information Knowledge Management and having worked as an academic at Al-Imam Muhammad Ibn Saud University, the researcher was motivated to consider the challenges facing academics in the electronic age as they seek to improve their information literacy and to exercise greater control over the multiplicity of available ways to search and find information. From this perspective, the motivation is the need to answer a number of related questions that the researcher needs to know. How can the researcher as an academic and any academic member improve here skills and practices in order to filter huge amounts of information very rapidly? How can they identify relevant information and determine its relation to core ideas or the information that they need and how can they judge the quality of the work? What are the basic facts, knowledge, practices, tools or methods that might improve their ability to find the most recent relevant information? To improve productivity, there is a need to establish how to deliver the right information to the right person at the right time, thus benefiting academia and society as a whole.

A second strand of personal motivation is the researcher's desire to serve her home country, the Kingdom of Saudi Arabia, by conducting dynamic research that can be directly and productively applied to a wide range of public and private sector activities in both academic and non-academic environments. It is hoped that the findings of the research will guide individuals in diverse positions to find and to select recent, high-quality, relevant information and data to support decision-making, thus making a major contribution to the efficiency of individuals and organisations in education, with consequent benefits for industry, medicine and other fields in the Kingdom.

The direct motivation here is to contribute to redefining good practice in dealing with information and data in the education sector with the help and support of all librarians, information centres and service providers in the Kingdom. This cannot be achieved without addressing the needs of information users and providing the appropriate services. In addition, it is hoped that the current research will help in identifying the essential characteristics of information provision to ensure the effectiveness of the various processes involved in storing, organizing and retrieving information resources.

For all of the above reasons, the current research can be considered original and novel at many levels, particularly since neither in the field of user studies nor in library studies, whether in the UK or Saudi Arabia, has KUTD been investigated from the perspectives of both users and service providers.

1.4 Research Contributions

The findings of this research make a number of contributions to the body of knowledge on information sciences and user behaviour, in particular about how staff and PhD students KUTD with developments in their fields of interest. The current research is also the first to discuss KUTD in general and to investigate it among academic staff and PhD students. Its main contributions are as follows:

- The current research is the first to provide a model of KUTD behaviour, modelling all of the different behaviours that can be adopted in order to KUTD.
- It has identified the various KUTD methods that can be used, which include high and low level of methods.
- It has investigated the diverse factors that can affect usage of particular KUTD methods.

- It provides guidelines on how university libraries should support KUTD services, which are expected to be useful for the University library and its website to follow.

The present research is the first to identify the various behaviours, approaches and modes available to staff and PhD students when they seek to KUTD with relevant developments. These behaviours, which include searching, browsing, monitoring and chaining, can be practised either passively or actively via both the online and offline modes.

The main behavioural findings are that both staff and PhD students seeking to KUTD tend to depend on active online searching and browsing, whereas they rarely use passive monitoring methods such as alert services. This finding, for which the current research has offered multiple justifications, contrasts with those of many studies reported in the literature that academics tend to use alert services to KUTD.

As to KUTD methods, the present research provides valuable data on the motivations and factors that can affect their usage. For example, participants who were older, more senior or in higher positions tended to rely more heavily on people and event (PE) and academic tools (AT) than younger and more junior participants did. Investigation of the various reasons behind these findings has allowed the research to provide robust evidence which can be considered when designing tools or training courses for academics. On the other hand, social media (SM) and library services (LS) tended to be used more by younger participants with less experience, although the research found relatively low usage of these methods for keeping up to date.

With regard to library services, the present research has developed guidelines on the best ways for an academic library and its associated website to support academics in keeping up to date. These guidelines indicate how such a library can facilitate these users' interactions, ensure the quality of their experience and satisfy their KUTD-related needs. The guidelines are the result of investigations that have identified typical obstacles to KUTD, categorised the services provided and suggested how libraries should first inform users of the available KUTD services, then deliver them and provide the necessary support; therefore, it is expected that the procedures proposed will be of wider usefulness, being suitable for adoption by academic librarians everywhere. The final contribution of this research is to the design of KUTD services, in that it not only categorises tools but shows how they can be matched to users' needs and how academics can be trained to enhance their use of the various KUTD

methods by learning the essential skills of searching for information, retrieving it and filtering it appropriately.

1.5 Thesis' Structures

This introductory chapter has described the background to the research, stated the problem and explained the motivation, in order to inform the reader of the research topic, to outline the issues to be investigated, to define the research population and to declare the main aim. The remainder of the thesis is structured as follows.

Chapters Two and Three review the relevant literature. Chapter Two offers broad coverage of related topics, including the history and development of KUTD studies, key terms and definitions, the relationship between ISB and KUTD, and descriptions of methods. It delivers an overview of ISB models potentially useful in the context of KUTD and discusses factors that may affect the usage of different methods. Chapter Three focuses more narrowly on methods of finding information online, the role of the academic library as a service provider and the use of the library and its website among staff and PhD students.

Chapter Four provides a comprehensive account of the methodology adopted, explaining and justifying the choices of research philosophy, strategy and methods of data collection and analysis.

Chapter Five delivers an analysis of the university website in the context of KUTD and examines how the library provides, promotes and supports KUTD services. Having outlined the relevant functions of the university library, it discusses the results of an interview with a senior librarian and presents its main findings.

Chapter Six describes the use of a questionnaire survey to gather quantitative data from KUTD service users, covering design and distribution, sampling, response rate, reliability, validity and ethical approval.

The next two chapters analyse and discuss the questionnaire data. Chapter Seven presents a descriptive analysis including normality testing, factor analysis and reliability, then Chapter Eight discusses inferential statistics obtained from the Mann-Whitney U and Kruskal-Wallis tests and canonical correlation analysis.

The interviews with staff and PhD students are reported in Chapter Nine, which describes the sampling, the interview procedure and the qualitative data analysis.

Chapter Ten, which includes a discussion of the main findings, an acknowledgment of the limitations of the research and a set of recommendations.

Finally, Chapter Eleven concludes thesis by presenting research conclusion and some suggestions for future work and more investigations.

Chapter 2: Literature Review

2.1 Introduction

This chapter offers an overview of the literature related to the present research. In light of the limited coverage of KUTD, the chapter begins by explaining how the literature was searched and by detailing the strategies used to compose this review. Its scope is limited to what is relevant to KUTD, so it is not intended to comprehensively review the ISB literature.

The review first considers the background and history of KUTD, with a discussion of the concepts most relevant to the topic, such as ISB and information need, and their relationships with KUTD. It then discusses the different ISB models that help to identify the most important KUTD behaviours and the more general ISB of staff and PhD students as related to KUTD. Next comes a detailed examination of factors such as gender, discipline, age, position and experience, and their effects on the behaviour of staff and PhD students as they employ the different methods of keeping updated.

Having thus explored the literature relevant to KUTD as a task, in other words from the perspective of staff and PhD students as benefit owners, the review then addresses KUTD as a service, focusing on the academic library as service provider. This section considers how libraries facilitate the KUTD services for users and how the literature deals with the relationship of the library with academic staff and PhD students.

The overall aim of this chapter is to identify pertinent knowledge gaps by comparing existing studies and their findings to the objectives of the present research, thus clarifying its scope and boundaries.

2.2 Searching the Literature and Writing the Review

This section first set out the strategies employed to search the literature for relevant material and ends with a brief account of the stages of writing this review. An initial search indicated that there were limited sources dealing with KUTD in general; most were very old studies referring to KUTD services provided by libraries, while the very few sources mentioned KUTD in the context of studies of the ISB of particular groups in a given discipline. In order

to overcome these difficulties, the researcher used many different information sources, such as Google Scholar (GS), Web of Science (WoS) and the Strathclyde University library website. GS and WoS identified appropriate sources, not limited to particular fields, journals or databases. Secondly, through the library website the researcher used Elsevier, Emerald and SUPrimo, the library's dedicated search tool. The researcher also used Research Gate, followed some academic accounts in the social media and searched information science databases such as LISA and EBSCO. Thirdly, the researcher sought the subject librarian's help and set up alert services for the tables of contents (TOCs) of several journals, including the Academy of Information and Management Sciences Journal and Alexandria: The Journal of National and International Library and Information Issues. The keywords and search areas of these alerts were changed from time to time to ensure full coverage.

Other strategies that the researcher followed in order not to miss any relevant piece of academic work included checking the references in any important papers and using the 'cited by' option provided by some search engines to identify other relevant areas or fields. The researcher also sought the advice of my supervisor on building the literature review and choosing search terms. Finally, the researcher tried both general keywords and very specific ones, and combined two concepts or fields as appropriate.

The researcher began by identifying the general topics related to the present research, then refined these to identify narrower topics or aspects that could be used to search for more relevant sources. For example, various ISB studies mentioned KUTD, so the researcher searched for relevant aspects of ISB, using keywords including 'information searching', 'information needs' and user-related topics such as 'user behaviour', 'habit', and 'interaction with information and technology'. The researcher also searched under 'information management', 'information overload', 'information organization', 'information sharing' and 'information encounter'. Other terms and expressions related to the main concept of the research for which the researcher searched were 'KUTD', 'current awareness', 'contents awareness' and 'keep updated'. Another major topic was academic libraries, which was refined to 'library use and academics', 'academic library services', 'benefit management in library services', 'KUTD services' and 'user expectations'.

This literature review was written in three stages, beginning with a focus on the background to KUTD, which involved a discussion of the main elements of the present research, notably the library as service provider, users as benefit owners and the academic environment. The second stage addressed the ISB of staff and PhD students, identifying various methods and

practices of information searching and academic research workflow, and introducing relevant concepts including information needs, information searching behaviour, information retrieval, information gathering behaviour, information organization behaviour, information use and information encounter. With the support and guidance of the supervisor, the researcher then moved the focus from ISB towards KUTD, the result being the review presented here.

2.3 History of KUTD and Definitions

The growth and development of electronic information resources and the marriage of computer technology and telecommunications have led to a new approach in information and communication technologies, where enhanced information access has caused a paradigm shift in information services. The concept of current awareness (CA) has seen a move from library-centred services to the user-centred paradigm (Mahesh and Gupta, 2008). Fourie (2001) states that only special libraries and academic organisations once offered current awareness services (CAS) because of the high cost involved, whereas today there are a number of accessible and user-friendly IT tools and services which are free or affordable and easy to use. Traditional CAS were also limited to textual information such as indexes, abstracts and newspaper clippings (Mahesh and Gupta, 2008), while electronic CA tools can now deliver many different types of information such as images and videos in addition to text. According to Mahesh and Gupta (2008), electronic CA focuses more on users' needs, using highly personalized tools to address these at multiple levels, namely the information needs of individuals, of groups with the same interests and of whole organisations (Fourie, 2001).

The move from print to electronic format has altered CA dramatically. What was once referred to as 'selective dissemination of information' (SDI) has now become notification systems, alerting services and information filtering (Mahesh and Gupta, 2008; Jetty and Paul Anbu K, 2013). Advances in information technology have helped to provide CA more rapidly and with greater relevance to users' information needs (Jetty and Paul Anbu K, 2013). Therefore, the definition of CA has changed from a selection of one or more systems that provide notification of the existence of entities newly added to the system's database or of which the system takes note, such as a document or a website event, for example conferences, discussion groups or editions of newsletters (Fourie, 2003); by contrast, CA now entails the creation of a personal environment of awareness using one or more information technology

tools (pushing and pulling) and both formal and informal channels of communication to inform users of the latest piece of information in a particular academic field. CA then developed from services provided by academic libraries to systems enhancing individuals' ability to keep themselves aware of recent developments by selecting and scanning reliable and authorised information sources (Rowley, 1998). The development of the internet has made it essential to empower users with the skills needed to locate information and this empowerment is not restricted to providing instructions to perform a particular task, but extends to supporting them to develop the transferable skills needed in the electronic age (Kirby et al., 1998). Thus, CA has moved from systems or services provided by information centres or libraries (the organizational approach) to individuals' ability to create, select and personalise different tools or methods to keep themselves updated with or without institutional support. Rather than a CAS delivering the right information from the right source to the right user at the right time in the right format and at the right cost (Fourie, 1999), CA can now take the form of environmental scanning, where users consider all sources of information in their environment (Srikantaiah, 2008).

To clarify the terminology, while 'CAS', 'alert services' and 'SDI' have often been used in the literature interchangeably and with more or less the same meaning (Xu, 2012), the present research prefers 'KUTD' because it denotes a more general concept covering both the services that libraries provide and all of the activities undertaken by individuals to keep themselves updated.

In a study by Pontis et al. (2015) who investigated the meaning of KUTD within the information journey by interviewing academics. They found that KUTD differed from one academic to another and that it had many aspects, including knowing all of the relevant facts about a topic, understanding its background, being aware of individual groups working on similar research and knowing what stage they had reached or what direction they had taken. KUTD also means that a researcher needs to know what competitors are working on, to avoid duplication and to identify aspects, topics and documents that have not been considered before (Pontis et al., 2015).

To summarize, in the past CA attracted the attention of LIS scholars (Xu, 2012), whereas today, notwithstanding the Pontis et al. (2015) study and the changing role of libraries, improving the ability of individuals to use advanced technology to deal with information, there remains little in the literature about how academics now keep up to date, which tools or methods they use, how they use them and why.

2.4 KUTD Methods

Among the methods which libraries and information centres used in the past to deliver CAS were acquisitions lists, consisting of new information sources available for users to order any materials newly arrived in the library or to add specific items to the list for the library to provide later. Other methods were the latest journal issues, hard copies of TOCs, indexes and abstracts, papers on conferences and workshops or summaries thereof (Fourie, 2006). Users could also browse the new books on the library shelves and seek librarians' help and it is notable that most of the traditional forms of CAS provided by libraries involved hard copy (Fourie, 2006).

Recent technological advances have allowed a shift in CAS provision from libraries to information providers such as the publishers of journals and databases, while the need to manage and control these electronic resources has generated a variety of tools and methods for users to KUTD. These include alert services (database alert, publication alert, search engine alert and citation alert) and Really Simple Syndication (RSS) feeds which provide the TOCs of relevant websites (Mahesh and Gupta 2008). Moreover, changes in the ways that scholars communicate, collaborate, access, share and disseminate information and knowledge have produced new types of tools which can support real-time monitoring of information resources and facilitate integration and communication between peers. These have included tools for social bookmarking (del.icio.us), media sharing (YouTube, Flickr), microblogging (Twitter) and social networking (Facebook) (Gruzd et al., 2012).

KUTD tools and methods can be divided into two main categories: pushing and pulling. The term 'push technology' can be used to describe anything from broadcasting to selective content delivery using sophisticated evolutionary filtering agents (Kendall and Kendall, 1999). Pushing tools allow visitors to access a website to seek information via social networks (Facebook, Twitter, LinkedIn), media sharing (YouTube, Flickr), social bookmarking (del.icio.us, CiteULike) and content collaboration (Wiki, JotSpot, blogging) (Lee et al., 2008; D'souza, 2011). Conversely, pulling tools allow users to subscribe to a message and retrieve it when they need it (Lee et al., 2008); these include TOCs, alert services, RSS feeds and website notification services.

The literature offers no evidence of how KUTD tools or methods are classified as either pushing or pulling; however, there are subcategories classifying those tools which depend solely on pushing or pulling techniques.

2.5 Related Concepts and KUTD Definition

The main aim of this section is to define KUTD. In order to do so, it comprehensively examines various related concepts and clarifies their relationships with KUTD. Keeping up to date evidently involves seeking and finding information. In recent years much attention has been given to how individuals interact with information, especially in the electronic environment, and human behaviour has been the focus of most recent studies related to KUTD, which have investigated the needs, activities, factors and processes involved in finding information.

The literature provides many different definitions of information behaviour (IB); the focus here is on those most relevant to the present research. Individuals engage in different activities to make sense of their environment and IB activities can occur in everyday settings including the work environment to meet individual information needs. The present research focuses on the academic environment and how staff and PhD students KUTD with developments in their fields. This context can impose particular behaviours and activities; therefore, it is very important to consider it (Popper, 1972). Indeed, human behaviour cannot be understood without considering the context, which provides a framework that reflects the meaning of individual experiences (Cool, 2001). In addition, understanding the behavioural processes of knowledge creation, information organization and information retrieval requires an understanding of the social and cultural aspects of that behaviour (Jacob and Shaw, 1998).

For Davenport and Prusak (1997), IB means how individuals approach and handle information. This definition refers to ways of seeking, searching, finding, controlling and retrieving information, which is what user studies are concerned with. Alternatively, IB includes information seeking, information foraging, information use, sense making, information organization and how people use different resources and formats of information to satisfy their needs (Sahu and Nath Singh, 2013).

IB is thus a broad term covering many aspects of ISB including passive seeking (Bates, 2005), which means that ISB is a form of IB. ISB can be defined as “the purposive acquisition of information from selected information carriers” (Johnson and Meischke, 1993), while Wilson (2000) defines it as the directed active seeking of information which reflects specific individual needs. These can be satisfied by interacting with both traditional and electronic information systems, such as libraries or electronic tools respectively. ISB can also include accidentally encountering, needing, finding, choosing, using and avoiding

information (Case, 2012). Hence, ISB can be categorized as either the active seeking of information by individuals who recognize that they lack knowledge, or passive seeking by those who come across interesting information by chance or accidentally, such as when watching TV or listening to the radio (Pálsdóttir, 2010; Williamson, 1997).

A number of authors have recognized information encountering as a passive form of ISB (Wilson, 1999; McKenzie, 2003; Foster, 2004a; Hider, 2006). Wilson (1999) calls this 'passive attention', while other refers to it as 'accidental discovery' (Williamson, 1997). Information encountering occurs when individuals notice interesting information that they were not actively seeking, including when browsing the web (Erdelez and Rioux, 2000). An alternative term for accidental discovery is 'serendipity' (Remer, 1965), a phenomenon which can result from engagement in different conditions, strategies and purposive or non-purposive ISB and knowledge acquisitions (Foster and Ford, 2003). It is often a consequence of browsing (Section 2.7.2.2.2 Browsing), where active ISB directed at some particular information reveals other information that was not being sought (Rice et al., 2001). Serendipity can also occur in the context of environmental scanning (Erdelez, 1996; Erdelez, 1997; Erdelez, 1999).

The remainder of this section locates KUTD with respect to the above concepts. IB provides an overview of human behaviours in dealing with information and thus encompasses all aspects of KUTD, from recognizing information needs to meeting them. IB also covers how KUTD previously involved services provided by libraries and more recently involves more options, facilities, methods and tools that individuals can use to ensure delivery of the right information at a given time and then to share it, communicate with others and interact with their environment, keeping track of all new developments by means of a range of technologies. KUTD includes finding new and interesting information by seeking and searching actively and by encountering it passively. Relying on technologies such as notification systems can be considered passive KUTD. Users can KUTD by means of IT tools for pushing and pulling information, including both formal and informal channels of communication.

It is clear from the above that the literature has defined IB and ISB in a very comprehensive way, showing that IB focuses on different behaviours and activities that involve seeking, searching for and finding information.

On the other hand, the literature defines CA services as being provided exclusively by libraries and information centres. In addition, the terms ‘CA’, ‘SDI’ and ‘content awareness’ have often been used interchangeably in the literature with more or less the same meaning, but these concepts still refer to the services provided by libraries or information centres to keep their users updated with latest development in their respective fields.

It is also significant that most of the concepts discussed in the literature focus on services delivered by libraries, such as current or content awareness. This restricts KUTD to activities involving libraries, in contradiction to the recent shift from the organizational approach to the user approach and the increasing number of information sources and volume of data, considering the online and offline activities of people and the technology available to them. These developments have made KUTD more general, widening its scope to include service providers and user activities which involve a range of different behaviours, approaches and modes.

Therefore, the researcher has used the existing literature as a starting point to develop a broad and original definition covering all of the different services, activities and behaviours engaged in by individuals and libraries in order to KUTD.

Overall, KUTD is a form of IB, depending on different aspects of ISB to gather information, which leads to the following definition, elaborated by the researcher:

KUTD involves a series of activities (such as information seeking and information searching) performed in order to recognize and discover interesting information or data which is current in a particular topic or field.

2.6 KUTD and Electronic Age Challenges

As regards users, technological advances have changed the academic environment; for example, the increasing availability of electronic information has affected the ISB of academic researchers (Tahir et al., 2010). Tenopir et al (2009a) states that academic researchers have begun to exhibit a variety of ISBs such as browsing, searching, following citations and seeking recommendations from peers, so as to create a strategy to find the required information. Moreover, due to the growth in the number of published electronic journals (Borrego et al., 2012) and the wide range of places where they are available, the reading habits of academics have also changed as they seek to keep up to date (Tenopir et al., 2009a).

One of the changes in the reading patterns of academics is a shift from print to electronic media, as evidenced by a decline in personal subscriptions and increased reading of e-journals (Tenopir et al., 2015). Nevertheless, other research shows academics still preferring print for more in-depth and comprehensive reading (Housewright et al., 2013a). Increasing the quality of information resources in the electronic environment has led academics to consult a wider range of journals (Borrego and Anglada, 2016) and they read articles more for research purposes (King and Tenopir, 2013). Superficial reading and browsing are common ISBs among academics in the digital age (Borrego and Anglada, 2016).

All of the changes mentioned above mean that staff and PhD students face particular challenges in keeping up to date, for example in identifying and locating the most relevant information among a vast body of literature that increases by millions of articles every year (Bjork et al., 2009; Khabisa; Giles, 2014). According to Hemminger et al (2007) academics reported being unable to find the required information on particular topics. Similarly, although information resources were more accessible than 20 years earlier, Saracevic (2009) found that it was still difficult to locate the required information in a limited time, partly because the rapid increase in information resources and publishing had led to an “information explosion” (Rudd and Rudd, 1986). Dealing with such large quantities of information can cause information overload (Benselin and Ragsdell, 2016). Thus, technology can be a cause of information overload, although at the same time it can provide tools to overcome it (Elwert, 2013).

Reducing the amount of information or narrowing the focus of a topic can be difficult for researchers (Pontis et al., 2016). Therefore, the ability to distinguish between relevant and irrelevant information is essential (Pontis and Blandford, 2015) and interacting with peers can be important in filtering out irrelevant information by customizing the choice of information sources (Pontis et al., 2015). Peers can also provide support and act as facilitators of information (Adams and Blandford, 2005). Meanwhile, libraries can provide services to help users develop effective strategies and train them to search for the required information (Korobili et al., 2011). While technology provides many tools and services to help users to select and filter information resources (Wellmon, 2012), they cannot maximize the benefits of these tools without learning the necessary skills (Bawden et al., 2000).

Technology provides a variety of tools which can help users to encounter information (Race, 2012), which provide recommendations (Toms and McCay-Peet, 2009), or which allow users to identify other people or events depending on individual interests (Forsblom et al., 2012).

KUTD methods and the environment can facilitate information encounter, especially when individuals are not actively searching for information (Pontis et al., 2015). Researchers tend to use information found by chance if it appears at the right time (Erdelez, 1999); otherwise, it can be saved for future use or shared with colleagues (Pontis et al., 2015).

As academic subjects become increasingly specialized, each with a set of unique requirements, it becomes harder to generalize the information-seeking process (ISP) for academics across different disciplines (Niu et al., 2010). Another issue is that lack of time for exploring online or offline methods and locating sources, along with lack of training, has led to poor skills in searching information (Baro et al., 2011; Pontis et al., 2015). Therefore, there is a crucial need to personalize information search practices which will encourage individuals to create their own personal environment of awareness in order that they stay abreast of relevant developments.

Such an environment can be created by staff and PhD students adopting one or more technology tools or KUTD methods. In order to choose the right group of tools or methods, users must have deep knowledge and understanding of their different features, how they work and what types of service they provide. They can then determine which of these tools or methods complement each other and which are most suitable for a particular need. The existence and use of such tools has brought a new approach to KUTD, involving the creation of a personal environment of awareness where groups of tools work together to match the needs of a particular user.

The present research seeks to understand how today's staff and PhD students KUTD with developments in the light of the above challenges, in order to provide better KUTD strategies and to design improved KUTD services that match users' needs.

2.7 Models of ISB

It is important to state what a model is and why it is widely used in order to clarify how to apply it in a given situation and what elements to consider to make it effective. A model can be defined as a framework for thinking about a problem or situation, usually depicting relationships among theoretical constructs (Wilson, 1999). It is more specific than a theory, which it places in context (Case, 2012). In the present context, it can take the form of a diagram representing information-seeking activities and the causes, consequences and

relationships between different stages of ISB (Wilson, 1999), thus helping to understand this phenomenon (Bates, 2005).

The literature offers many different ISB models, each with its own perspective. Wilson (1997) identifies three essential elements of any information behaviour model as (i) information need and motivation, (ii) the factors affecting behaviour and (iii) the associated processes and activities. Contributors to the literature have attempted to improve the conceptual and theoretical aspects of user studies (e.g. Wilson 1999; Savolainen, 1995; Leckie et al., 1996). The realisation that a conceptual model allows a focus on individual users' actual or perceived everyday information needs and behaviour, rather than on system design, prompted a cognitive approach to user studies during the 1980s (Wilson, 1984; Dervin and Nilan, 1986).

There were several factors behind the need to improve various conceptual and theoretical aspects of user studies. Firstly, while existing quantitative methods of studying human ISB reflected individual differences in activities, they did not provide deep insights into the motivations behind certain behaviours or practices (Wilson, 1999). Secondly, user studies fell under the umbrella of information science, a field which paid little attention to related work that could support theoretical models of human ISB (Wilson, 1999). Finally, general ISB models had been adopted since the mid-1980s. The result was that qualitative methods were adopted in user studies, which also borrowed theories from related fields such as social science (Wilson, 1999). Thus, many models including those of Ellis, Kuhlthau and Wilson became available as the basis of further studies. The following sections describe those most relevant to the present research.

2.7.1 Related Models of ISB in Higher Education

This section provides a general overview of some models of ISB that can be considered useful in academic contexts.

Kuhlthau (1991) model provides more details of the search process and how to assess it, rather than just how to locate different information resources. The second model is that of Leckie et al (1996), which deals with the information-seeking activities of professionals such as engineers, healthcare workers and lawyers. As to Wilson's (1981) model, it considers individual factors such as environment and role that affect information needs and addresses the same ISB activities as Ellis model. Finally, Foster's (2005) non-linear model of the ISB

of inter-disciplinary researchers differs from most earlier models, which grouped activities into linear processes. Foster (2005) investigated the interrelationships between behaviours and activities by conducting in-depth interviews with academics and postgraduate researchers whose research focus was inter-disciplinary (Foster, 2005). Despite its non-linear approach, it has a set of ISB activities in common with the Ellis model, which is discussed below.

This review of ISB models establishes a theoretical background for the present research, to collate all possible information-seeking activities of academics and to determine which could be used in KUTD tasks. Since it concludes that the models of Ellis (1993) and Bates (2002) are most directly applicable to the current research; each of these is now discussed in detail.

2.7.2 Adopted Models

2.7.2.1 Ellis's Model of ISB

Ellis (1993) used semi-structured interviews and grounded theory to investigate ISB in the social sciences, concluding that it has six elements:

Starting: to seek information.

Chaining: either tracking references cited in information sources (i.e. backward chaining) or identifying the sources which have cited references (forward chaining).

Browsing: semi-structured searching in an area of potential interest.

Differentiating: filtering and evaluating information sources by considering their quality, relevance and other characteristics.

Monitoring: following the latest developments in a field.

Extracting: searching systematically to identify relevant information sources.

Further studies of the ISB of physicists, chemists (Ellis et al., 1993) and engineers (Ellis and Haugan, 1997) added two more activities Figure 1:

Verifying: checking the accuracy of information.

Ending: the characteristics of information seeking at the end of a topic.

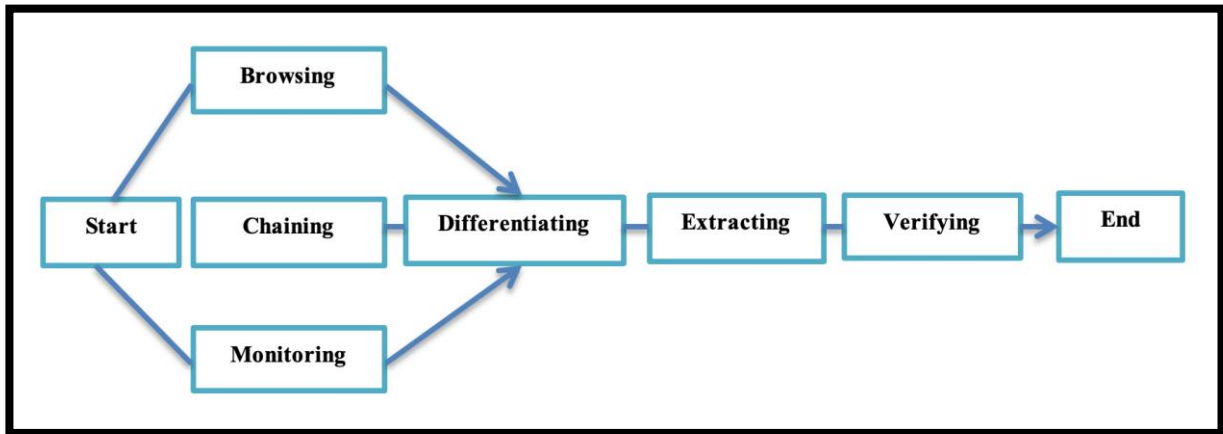


Figure 1: Stages of Ellis's Behavioural Framework (Ellis, 1993)

Most of the information-seeking activities that Ellis describes represent behaviour that differs across disciplines. Therefore, Ellis's model is not applicable to different groups of users without considering the many factors which could affect their ISB, such as type of needs, context, available data, sources and their characteristics. The model also fails to address interactions or interrelationships between activities (Ellis et al., 1993) and its application will vary from person to person within the same discipline, depending on individual needs and situations (Ge, 2010). However, the model can be used to refer to the relationships between activities in general terms, unless there is an indication of certain patterns of information seeking (Ellis, 1989; Robson and Robinson, 2013).

Meho and Tibbo (2003) conducted interviews with 60 members of social science faculties in 14 countries and modified Ellis's model by adding these behaviours:

Accessing: different information sources.

Verifying: checking the accuracy and quality of information that has been found.

Networking: building relationships with others, communicating with them and maintaining these relationships.

Information organizing: managing, gathering, archiving and organizing the collected information.

The resulting new model comprises four interrelated stages, each potentially involving a number of activities as follows (Meho and Tibbo, 2003):

Searching, where researchers engage in starting, chaining, browsing, monitoring, differentiating, extracting and networking activities during their information searching.

Accessing, where researchers decide if they want to proceed or return to the searching stage, depending on whether they have found the desired information.

Processing, which may involve chaining, extracting, differentiating, verifying, information management, synthesis, analysis and writing (Meho and Tibbo, 2003). These last three activities are important features of research but do not form part of ISB.

Ending, where the research cycle ends.

Makri et al (2008) used semi-structured interviews to investigate the ISB of 27 academic lawyers and found that it fitted the behavioural framework of Ellis's model, with the addition of some other behaviours not discussed in earlier studies, namely selecting, keeping updated, recording, collating and editing. The study also identified subsets of behaviours; for example, searching electronic resources was found to involve behaviours at the levels of resources, sources, documents, content and search query/results. The authors conclude that Ellis's model can be useful for designing better information-seeking methods (Makri et al., 2008).

All of the above studies involving the Ellis model used qualitative method and grounded theory. They also identified similar behaviours, comprising non-sequential steps potentially involving more than one behaviour at a time (Ellis, 1989). Finally, Ellis's model identifies different types of behaviours that can be used in system design during the searching process (Ellis, 1989).

2.7.2.2 Bates's Model

Bates (2002) identifies four modes of ISB which describe an individual's behaviour without considering the environment, although this can affect the adoption of a particular mode (Jiang, 2013). The model consists of the following behaviours Figure 2:

2.7.2.2.1 Searching

Choo et al (2000) distinguish between active and passive searching. Active searching involves all types of actions or activities undertaken to find or seek information, which means that seeking involves spending time and effort (Bates, 2002). This type of searching includes interaction with the environment, such as by:

- Navigating the internet with search engines,
- Reading a book or an article,
- Asking questions,
- Visiting information centers or libraries,
- Or using social media tools to search for a particular person, to ask about something or to discuss a subject or information.

Passive searching occurs occasionally when a search of indexes, for example, produces other information relevant to the individual's area of interest (Bates, 2002).

Directed active searching involves anything individuals do to find and seek information when they have a specific target to search for using focused keywords and IR (Bates, 2002), such as using keywords to find information within databases or articles in Research Gate. Such searches therefore require advance knowledge of needs and of specific keywords.

Undirected active searching, by contrast, occurs when individuals seek or search for information actively, but with limited and unstructured effort (Bates, 2002). This type of search helps to widen one's knowledge in an area of interest. Examples are:

- Checking a Twitter account
- Searching tables of contents
- Attending departmental seminars
- Joining a committee
- Posting questions.

2.7.2.2.2 Browsing

Browsing is a general behaviour which may occur whether or not an information need is recognized.

Browsing is the activity of engaging in a series of glimpses, each of which may or may not lead to closer examination of a (physical or represented) object, which examination may or may not lead to (physical and/or conceptual) acquisition of the object (Bates, 2007).

Choo et al (2000) contrast the directed and undirected browsing strategies:

People engage in directed browsing when looking for certain information or within a particular topic. The purpose is to evaluate the importance of information and exclude any

undirected browsing (Bates, 2002), with a focus on important developments in the area of interest. Examples are:

- Browsing certain sources, such as journals or databases.
- Browsing in a hierarchy for related information.
- Browsing tables of contents of particular journals.
- Browsing lists of titles or subject headings.
- Browsing conference papers.

The focus here is on listing information or grouping subjects or headings by considering the search for information at the micro level. The browsing process consists of the following elements:

- Behaviour (scanning)
- Motivation (goals)
- Cognition (an object)
- Resources (form) (Rice et al., 2001).

Undirected browsing is relatively unfocused and happens when individuals have no specific information need beyond considering the broad context (Bates, 2002).

Broadly, searching involves the use of cognitive resources to recall from memory a particular query that reflects one's information needs, whereas browsing tends to depend on the user's perceptual ability to find relevant information (Marchionini, 1997).

2.7.2.2.3 Monitoring

Monitoring usually involves tracking or keeping one's eye on the most recent information or resources (Jiang, 2013). According to Makri et al (2008), it allows individuals to keep updated with developments in the area of interest, focusing on a small number of core sources. Monitoring can be either active or passive (Bates, 2002).

- Active monitoring uses pushing tools, such as conducting a search on a particular topic or sources in digital libraries or webpages
- Passive monitoring uses pulling tools such as email alerts or RSS subscriptions (Kendall and Kendall, 1999).

In addition, when people interact socially, they may come across interesting information (Bates, 2002).

2.7.2.2.4 Being Aware

Simply being aware can lead an individual to absorb random information and this can be seen as a mode of information encounter (Erdelez, 1997; Williamson, 1998). Information can be encountered anywhere at any time, via channels including the web, and can be used for any purpose (Erdelez and Rioux, 2000). Overall, both monitoring and being aware tend to be informal; therefore, individuals may be unfamiliar with these modes (Jiang, 2013).

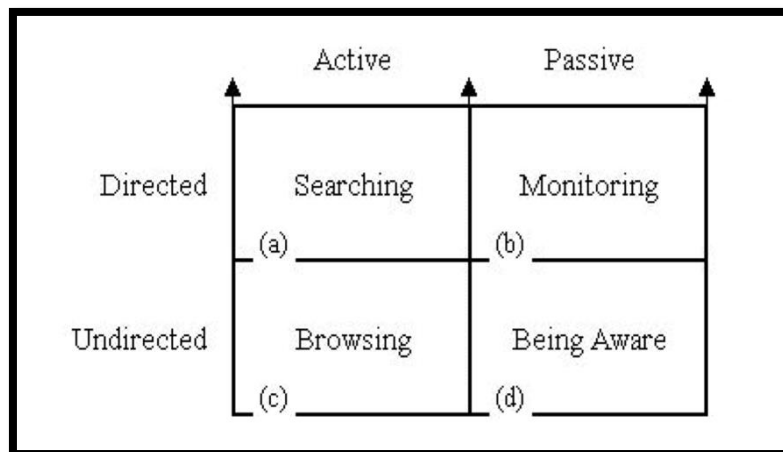


Figure 2: Information Seeking Model (Bates, 2002)

2.7.3 KUTD Model

This section explains how the Ellis and Bates models were used to create a theoretical model for the present research. They focus on users' online ISB patterns, consistent with the present research's approach. Ellis's well-established model is a general one that can be applied to many different contexts and academic disciplines, rather than being restricted to particular user groups. It had been cited in more than 150 papers by 2002 and has been used in many different studies (e.g. Choo et al., 1998; Järvelin and Wilson, 2003; Ikoja-Odongo and Mostert, 2006; Prabha et al., 2007).

Combining the Ellis and Bates models allows the identification of a set of activities and approaches that can be followed to KUTD Figure 3 and which provide the basis of variables in the statistical analysis of the present research. These activities include Ellis's searching, browsing, monitoring and chaining activities, Bates's active and passive approaches and the online and offline modes. Figure 3 shows how the various KUTD tools and methods relate to

each activity, providing an in-depth understanding of which methods or tools are most useful for KUTD and why later on.

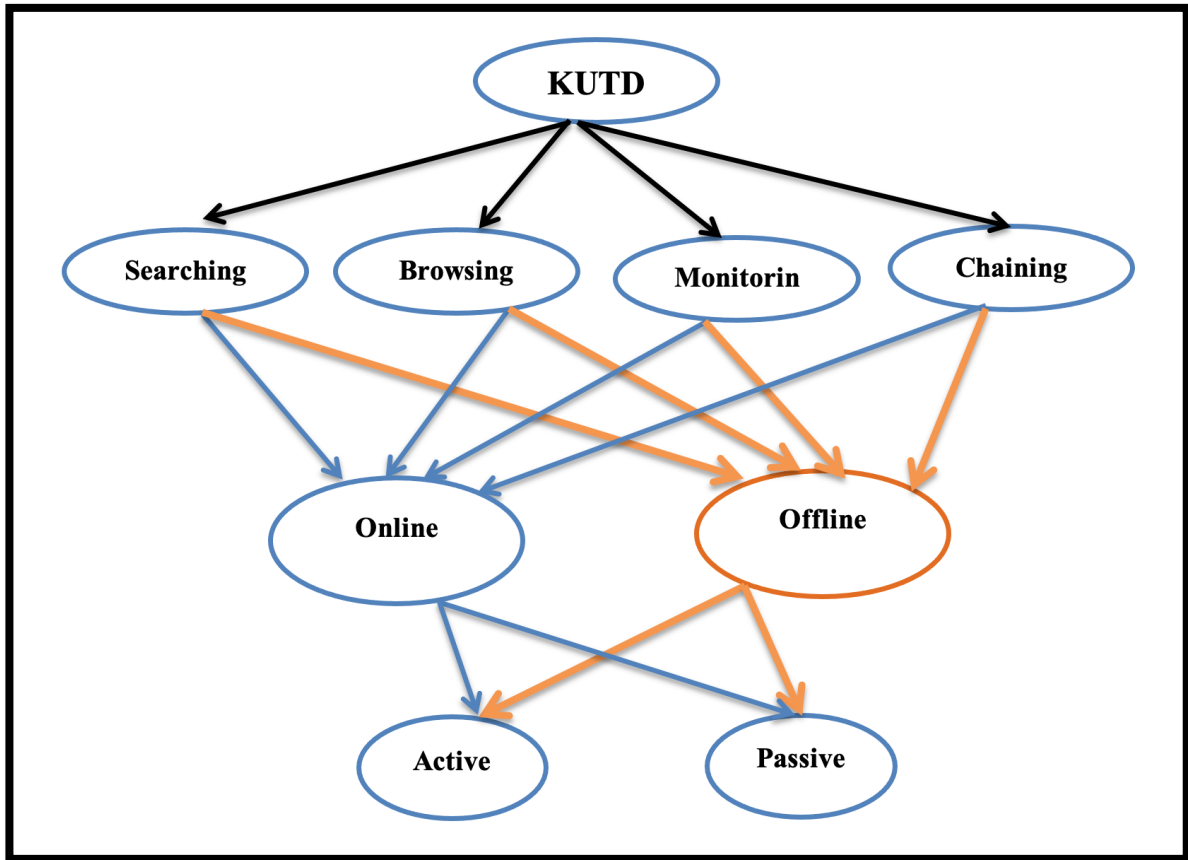


Figure 3: KUTD Model

2.8 ISB of Academic and PhD Students (Benefit Owners)

The following subsections discuss the ISB of academic staff and then of PhD students, to identify the main features of their behaviour and any notable similarities and differences between them, taking into account the different tools and types of information sources that they use.

2.8.1 Academics' ISB

The ISB of academics has been widely investigated in the literature (Palmer, 1991b; Palmer, 1991a; Haines et al., 2010; Sahu and Nath Singh, 2013), reflecting the importance of this subject group as active users of a variety of sources of information which they exchange, manage and produce (Kwon, 2017). Academic researchers are responsible for the creation

and dissemination of information and the transfer of knowledge both inside and outside the academic community. Their work also has a great impact on government, business, culture and civil society (Bastow et al., 2014). Indeed, academic research can be seen as the most important part of any innovative project, since it can help to develop higher education systems while forming the core of economic developments (Butcher, 2005). At the same time, academics face many challenges such as working in a very competitive, selective and constantly changing environment (Belluz et al., 2016), across different institutions or organizations, often on a part-time or contract basis and with small budgets (Teichler and Cummings, 2015). All of these circumstances put them under pressure to nurture their reputations through peer support and competition, working conditions and enhanced professional development (Müller, 2014a; Müller, 2014b). The present research aims to improve KUTD in academia in the belief that this would have a knock-on effect across academic society, ultimately leading to social gain.

The context in which ISB occurs is the academic environment (Poteri, 2007), which encourages the learning and discovery activities of individuals who seek to expand human knowledge by conducting research (Llull, 1991). According to Marchionini (1997), this environment includes administrative staff, students (undergraduates and postgraduates), academic staff (professors, readers, lecturers) and research staff (postdoctoral researchers and research fellows). The academic context can also be said to consist of activities such as teaching and conducting research, which reflect the information needs of staff and PhD students and lead them to seek a variety of information sources to match their individual needs. The factors which shape ISB include time, place, type of participant groups and their demographic, social, educational and behavioural characteristics (Gaslikova, 1999). Therefore, the ISB of academic staff and PhD students will be affected by their academic positions, roles, habits and practices. The following subsections discuss ISB among academic staff as defined above and other academics (post-doctoral researchers and doctoral fellows), before turning specifically to PhD students.

2.8.1.1 Searching

The literature has widely discussed information seeking and communication among academics (Wickramanayake, 2010). More attention has been paid to the ISB of academics and their use of information resources than to teaching, services and administrative work. Academics follow several approaches when searching for information. They can find relevant

information by searching for a particular topic, keyword, book or article, or by seeking colleagues' help. Searching is an important activity at any stage (Ellis et al., 1993; Foster and Ford, 2003) and starting with a well-defined goal, with known keywords or names to search for, is called direct searching (Palmer et al., 2009). Using keywords is very common among staff when using electronic sources such as academic journals and databases (Foster, 2004b). Academics also use bibliographic references to find items to read or consult; this is called backward chaining, whereas forward chaining is finding subsequent relevant publications (Palmer et al., 2009). Academics tend to use chaining across disciplines (Bronstein, 2007; Rupp-Serrano and Robbins, 2013). Chaining enables them to understand the landscape of a particular field, save time and identify the most relevant information (Brockman et al., 2001; Duyx et al., 2017).

2.8.1.2 Browsing

According to Bates (2007), browsing means looking at a body of accessible information in a series of glimpses which may or not include a closer examination leading to information acquisition. Humanities, social science (HASS) and inter-disciplinary academics tend to depend heavily on browsing (Ellis and Oldman, 2005; Meho and Tibbo, 2003; Tsatsou, 2017; Jamali and Nicholas, 2010). There is a detailed discussion of ISB in relation to disciplines in (Section 2.9.2 Disciplines).

2.8.1.3 Monitoring

Monitoring means periodically reviewing relevant information (Ellis et al., 1993), by means of alert services, networks or citation tracking. The monitoring of electronic sources via alert services and RSS is the main source of CA information (Attfield and Blandford, 2011). Alerts are notifications consisting of content or reference to time-sensitive items requested by a user (Jetty and Paul Anbu K, 2013). Secondly, networks are used to communicate with peers to KUTD with developments (Palmer et al., 2009). Finally, citation tracking is a “consequence of the different monitoring activities” such as chaining and accessing items to find new information sources (Palmer et al., 2009). Astronomers tend to use CA services to search for information (Tenopir et al., 2005), while inter-disciplinary humanities scholars tend to use pushing services such as subscriptions and notifications (Palmer and Neumann, 2002).

Academics use many different techniques to search and locate information sources but these fall outside the scope of the present research. During the research process, academics engage in many activities that vary with the purpose of the behaviour. Initially, they may use citation chaining or browsing to discover new materials (Bronstein, 2007). At all stages, they engage in verification and differentiation to evaluate the information they have collected (Bronstein, 2007; Ellis et al., 1993). Palmer et al (2009) found that staff used searching, browsing, monitoring and chaining to find information. Other behaviours adopted by staff include the deep reading of printed materials (Housewright et al., 2013a) and the use of electronic journals for reading relevant articles; however, while academics read an increasing number of articles, at the same time they dedicate less time to reading each article (Tenopir et al., 2015). The number of academics using electronic journals and related technology is increasing (Mulligan and Mabe, 2011) and journals are the main source of academic information (Borrego et al., 2012).

A study of the main literature-searching tools found that academics frequently used databases and internet search engines such as Google Scholar, while very few used library catalogues and visiting a library was a rare option (Borrego and Anglada, 2016). Meanwhile, academic libraries are the main route for accessing academic documents and the free documents on the internet are a second option (Borrego and Anglada, 2016). Academics use social media networks infrequently, yet these have received much attention as tools to disseminate research output (Nicholas et al., 2015). Social media will be discussed in detail in (Section 2.11.1).

In general, most academics tend to follow the same searching strategies, using the same tools and similar methods to KUTD (Housewright et al., 2013b).

2.8.2 PhD Students' ISB

PhD students constitute a relatively small group compared to those with whom they share their ISB, namely academics and other graduate students (Spezi, 2016), yet they are a very active research group conducting high quality studies and reflecting the capacity of their organizations.

PhD students tend to have more advanced information skills and ISB than undergraduates, who are still building their knowledge and improving their academic skills (Jamali and Nicholas, 2008). PhD students are integrated with their departments and academic

environment and tend to have a specific research approach within their research domain, focusing on sources and information relevant to well-defined aims while ignoring others. They are expected to have many research skills that can help them to build their knowledge and make contributions to their respective fields.

Staff usually work on multiple research topics and provide a research framework with research supervision for PhD students, which reflects their high level of knowledge and deep understanding in their field. By contrast, PhD students tend to be day-to-day project researchers focusing on one topic (Spezi, 2016). They are still building their own perspectives, academic identity and knowledge contributions, whereas academics are established researchers (Larivière et al., 2013). PhD students can sometime facing difficulty on choose their research topic and identified relevant information (Horlings and Gurney, 2013), due to a lack of confidence in their research work (Carpenter, 2012) compared to academics, who can evaluate information and have high levels of familiarity that can help them to determine its relevance (Pontis et al., 2015). In addition, PhD students generally lack awareness of different information services and resources (Al-Muomen et al., 2012). These differences compared to academics will affect PhD students' ISB.

The different aspects of PhD students' behaviour investigated in the literature include their relationships with their supervisors (Mainhard et al., 2009; Sugimoto, 2012; Howells et al., 2017), their information practice such as searching patterns (Carpenter, 2012; Nicholas et al., 2017; Pilerot, 2016), their library use (Jiao et al., 2008; Delaney and Bates, 2018), their information needs (Vezzosi, 2009; Exner, 2014; Bishop, 2015) and their information management (Williamson et al., 2008; Chiware and Becker, 2018).

2.8.2.1 Different Behaviours and Methods of PhD Students

PhD students engage in behaviours including searching, citation chaining and browsing (Green and Macauley, 2007), the main features of their ISB being the use of multiple keywords, search engines, websites and library resources, with multiple attempts to construct search queries (Du and Evans, 2011; Hsin et al., 2016). They tend to lack advanced search skills such as Boolean logic and modified keywords (Catalano, 2013). Indeed, their ISB is neither methodical nor systematic, depending instead on more digging and trying different approaches (Barrett, 2005). Another way in which this differs from academics' ISB, according to Tenopir et al (2015), is that when evaluating information sources, academics

depend on peer reviews, a journal's reputation and contents as the most important criteria of the quality of information sources. In contrast, it seems that PhD students do not have a full understanding of essential criteria for selecting information sources (Spezi, 2016).

PhD students tend to cite more recent papers (Gingras et al., 2008; Costas et al., 2010). They depend heavily on citation chaining in relevant works (Fleming-May and Yuro, 2009) to identify the most relevant sources and reduce information overload (Catalano, 2013). Hsin et al (2016) investigated three groups: less experienced doctoral students, experienced ones and junior faculty. They found that the less experienced students used references in the main articles to find further related information sources, whereas more experienced students tended to use chaining techniques such as tracking the citations of academic authors, identifying pioneer authors and following their publications, and referring to articles suggested by other information sources.

Bøyum and Aabø (2015) address reading behaviour, noting a change from linear reading to browsing activities such as bouncing, flicking and skimming. Furthermore, PhD students adopt "good enough" searching strategies, adopting familiar strategies and methods that they have used before (Brown and Swan, 2007). As to methods, they tend to use Google and Wikipedia when they are unfamiliar with a topic (Connaway et al., 2011), while journals are their main source of academic information (Carpenter, 2012).

PhD students tend to quit searching if they face difficulties in accessing full text sources, whereas more experienced students tend to find the items via other sources such as databases, library resource services and social media networks (Hsin et al., 2016). Their library use involves interfaces, catalogues, journal indexes and database lists (Wu and Chen, 2012). However, while the library is their main gateway to information resources (Tenopir et al., 2012b), PhD students tend not to seek librarians' help, because they do not believe that they will understand their research topic adequately (Rempel, 2010).

In terms of social ISB, Wilson (2006) notes that colleagues' recommendations or information exchange usually involve people. PhD students consider their supervisors the most important sources to consult (Green and Macauley, 2007; Catalano, 2013). They also discuss ideas and share information about pioneer authors and sources with their peers (George et al., 2006; Willson, 2016) and tend to ask them questions that they cannot put to their supervisors because they fear being judged as weak or having limited knowledge (Sadler and Given, 2007).

PhD students are generally interested in using social media networks (Bolton et al., 2013) to keep abreast of developments, to discover new information sources and to be aware of important news in the academic community (Cann et al., 2011), whereas academics prefer to attend events, consult colleagues and scan lists of conference papers as important steps towards staying updated with academia (Hsin et al., 2016).

Overall, it seems that academic staff and PhD students have similar ISB and use the same methods. However, students are still building their own knowledge, so the methods they use to evaluate information resources and identify relevant references reflect a lack of advanced or well developed searching skills. In addition, information literacy skills can be different when PhD students start their research, while the speed of their progress can differ and their “way of doing things” will depend on cultural or environmental factors (Spezi, 2016).

2.9 Factors that can Affect ISB

The aim of the present research is to investigate how staff and PhD students KUTD with developments in their fields and to identify the factors that can affect their use of different methods. There is little in the literature about KUTD in general and most studies do not discuss KUTD behaviour among staff and PhD students, focusing instead on the KUTD services that libraries provide (Barrueco Cruz et al., 2003; Fourie, 2003; Fourie, 2001). This makes it difficult to find evidence of different KUTD methods. Therefore, this section discusses KUTD as a task and a service at the same time.

The discussion of KUTD as a task will focus on the methods used and the factors that can affect the use of different methods among staff and PhD students, including demographic factors such as gender, discipline, age, position and experience. With regard to KUTD services at Strathclyde University, the service provider (the library) and service benefit owner (the users) will be discussed to show how the role of the academic library in providing these services has changed in the electronic age. Light will also be shed on the relationship between users and libraries, by considering how the latter can provide KUTD services to the individuals who use many different tools and methods to find and access information resources.

This review is not intended to cover all of the literature on ISB, but concentrates on comparing different ISB studies and the various factors that affect human behaviour, as related to KUTD. The main purpose is to find the most important factors that could help in

justifying the present research of KUTD behaviour. A secondary aim is to reflect the knowledge gap that has been identified by providing evidence of a lack of research on certain aspects of KUTD.

Human ISB is one of the most interesting areas of information science and many studies have examined methods of seeking and using information (Bates, 1996). The most important topics of end user studies are ISB and information need, while KUTD is considered part of information need and seeking. Therefore, the review focuses on ISB literature as one aspect of KUTD research.

Studying the ISB of academics is challenging because they play different roles such as researcher, educator, planner, supervisor and administrator (Sahu and Nath Singh, 2013) and because technological advances have led to continuous changes in information sources (Kuruppu and Gruber, 2006). Practices and preferences in using the various information-seeking methods also vary according to one's university, discipline, sub-field or academic experience (Tenopir, 2003).

Studies in the literature can be classified as follows. The first category concerns patterns of ISB in selected disciplines; it includes searches in one discipline (Meho and Tibbo, 2003; (Makri et al., 2008; Sahu and Nath Singh, 2013) and studies comparing different disciplines (Ellis et al., 1993; Brown, 1999a; Jamali and Nicholas, 2008; Sheeja, 2010). It has also been found that the ISB of inter-disciplinary scholars differs from that of those who work in well-established fields (Bates, 1996), justifying inter-disciplinary ISB investigations such as those of (Wilson, 1997; Ge, 2010; Jamali and Nicholas, 2010).

The second category focuses on the ISB of particular groups such as students, professors and universities (Whitmire, 2002b; Jankowska, 2004; Nicholas et al., 2009; Brindesi et al., 2013; Madden, 2014), while the third comprises studies exploring ISB in a local context, namely the country where the academics work and live (Ileperuma, 2002; Al-Muomen, 2009; (Μπρίντεζη et al., 2011).

Many studies in the literature indicate how technological developments have changed users' behaviour (Brown, 1999b; King et al., 2003; Talja et al., 2007; Hemminger et al., 2007). In the past, electronic resources were used only in certain disciplines (Tenopir, 2003), but they are now widely pervasive (Niu et al., 2010). Therefore, the fourth group examines the ISB related to particular resources, such as libraries (Leckie and Given, 2005; Zha et al., 2015) or to specific technologies such as the web (Kari and Savolainen, 2003), digital journals

(Nicholas et al., 2006b) or Google (Jamali and Asadi, 2010). Finally, many studies focus on how ISB can be improved. Some cover theoretical aspects (Ellis and haugan, 1997; Bates, 2002; Meho and Tibbo, 2003), whereas others are concerned with practical features including system design and services (Haines et al., 2010; Zhitomirsky-Geffet and Blau, 2017; Farzan and Brusilovsky, 2019).

In general, many studies acknowledge demographic factors such as gender, age, field of research and level of education as important indicators to be considered when studying users' online information behaviour (Maghferat and Stock, 2010; Sheeja, 2010; Singer et al., 2012; Weber and Jaimes, 2011). Previous studies found that among the most important factors affecting ISB were academic position (Niu and Hemminger, 2012), the purpose of the search and gender (Lorigo et al., 2006; Dervin and Reinhard, 2007; Young, 2000; Kennedy et al., 2003); however, there is little information in the literature about research purpose as a factor. Other studies have found interrelations between human factors such as gender and experience, while gender also affected navigation patterns in online information seeking (Chen and Macredie, 2010).

The factors discussed successively in the following subsections are gender, discipline, age, position and experience.

2.9.1 Gender

The present research investigates whether there are gender differences in using different KUTD methods. In general, there is little information in the literature about gender differences in KUTD and no discussion of gender differences in the use of methods such as search engines. Many studies have found searching via engines to be the most popular activity (Kerins et al., 2004; Head and Eisenberg, 2011; Sin et al., 2011). Vezzosi (2009) reports that searching databases or e-journals was not as popular as using search engines. However, the literature does not discuss this as a method for staff and PhD students to KUTD. Therefore, the following paragraphs review findings on the effects of gender on searching online for information, rather than the use of search engines specifically, in order to provide a larger profile.

Many studies have investigated the influence of gender on individual behaviour in using and seeking online information (Urquhart and Yeoman, 2010; Halder et al., 2010). Despite the many studies of human factors in general and gender in particular, there has been no

comprehensive overview of the different aspects (Chen and Macredie, 2010). Previous studies have differed in their findings, reflecting the inconsistency in these studies. These findings on the relationship of gender to online information behaviour can be categorised into three types: (i) males outperform females, (ii) females have more positive attitudes and (iii) there are no major gender differences.

It is evident from Table 30 Appendix 1 that gender has an impact on online information seeking. Most of the research in the first group found males to be better at searching online for information, while females reported discomfort. In many studies, females reported high levels of anxiety associated with low confidence when searching for online information compared to their male counterparts (Jackson et al., 2001; Schumacher and Morahan-Martin, 2001; Liaw, 2002; Koohang, 2004; Karavidas et al., 2005; Large et al., 2002; Peng et al., 2006; Li and Kirkup, 2007; Hu et al., 2012). This lower confidence may be explained by differences in technological competence (Jakobsdóttir et al., 2004). Furthermore, females tend to face difficulty in finding information effectively (Ford et al., 2001; Gustavson and Nall, 2011).

In the second group, however, some studies reported that females had more positive attitudes to searching online (Kim et al., 2007; Steinerová and Šušol, 2007; Richard et al., 2010).

The final group of studies indicated that there were no gender differences in results, but that the two genders did differ in how they used online information (Hupfer and Detlor, 2006; Hong, 2002; Koohang and Durante, 2003; Ory et al., 1997). Tsai and Tsai (2010) found that males and females had the same level of confidence when they explored online information, but females were more likely to use it for communication purposes. An international study by Drabowicz (2014) investigated the possible influence of gender on adolescents' use of information and communication technology in 39 countries and found that males tended to use computers more for educational purposes and females for communication. Thus, there were no significant gender differences in using online information, but females differed from males in the manner of their usage.

Most of the studies in the literature used questionnaires to collect data, most often from students in general and undergraduates in particular. Some other studies have examined detailed differences in behaviour between males and females in specific contexts or on particular tasks; however, their findings are inconsistent as to which gender performs better and there may be several reasons for this. Firstly, the purpose of using online information can

be very general, such as the investigation by Tsai and Tsai (2010) of gender differences in internet use among junior high school students, whereas others were concerned with specific purposes; thus, the participants in a study by Roy and Chi (2003) were searching for information to answer a particular query, while Liu and Huang (2008) studied navigation patterns. Secondly, most of the studies in the literature examine gender differences in non-academic contexts such as online shopping (Laroche et al., 2000), online tourism (Xie et al., 2006) and advertising (Jansen and Solomon, 2010; Striteský et al., 2016). Thirdly, most of the studies take a self-report approach, which can differ from one user to another. An individual's perception of how to complete a task can also be different from the way the task should be done (Winne and Jamieson-Noel, 2002). Some studies have attempted to tackle the self-report issue by using computer logs to determine gender differences in search performance (Zhou, 2014; Jansen and Solomon, 2010).

2.9.1.1 Search Engines and Gender

Niu and Hemminger (2012) report that males tend to use Google more than females. The reason may be that Google provides comprehensive results that include different types of information resources, suiting males, who tend to prefer something extensive and complete, whereas females prefer to investigate and formulate (Burdick, 1996). The study also found that searchers who used Google tended to be less confident than those who used library webpages (Niu and Hemminger, 2012). A possible explanation is that Google provides very generic results without guaranteeing their relevance (Vibert et al., 2007), while library webpages are more reliable, so that searchers trust the authority of the results. In addition, experienced searchers became familiar with the library interface search functions (Niu and Hemminger, 2012).

2.9.1.2 Library Services and Gender

Before discussing library services, it is important to define library collections and materials, which include online information resources that can be accessed through the internet, such as electronic journals, e-books and other online formats (Joo and Choi, 2015). Library collections also include printed information resources. Several library and information studies (LIS) do not report the use of library services as a way to KUTD and they report no significant gender differences in using online library services (Urquhart and Yeoman, 2010; Samson, 2014). As previously discussed, gender does affect ISB (Maghferat and Stock, 2010;

Lim and Kwon, 2010). In terms of ISB and digital libraries, the focus was on the frequency of seeking activities and time spent using library information resources that have been fully accessed without barriers to facilitate human knowledge (Yan and Davison, 2013; Heradio et al., 2012). The literature reports some studies of ISB and digital libraries; however, there is little discussion of gender in this context (Gefen and Straub, 1997; Nicholas et al., 2010a).

There are inconsistencies in discussing gender and library use in general, but at the same time most of the studies indicate that females tend to use library resources more than males (Whitmire, 2002a; Jones et al., 2009; Stone and Collins, 2013). In addition, females tend to use library collections more than males; a study found that 58% to 61% of all library users were female (Herrera, 2016). Most previous studies have examined library usage among undergraduates, but similar results are reported for staff and PhD students. For example, females tend to search library webpages more than males, as they prefer better organization and reliability of results (Niu and Hemminger, 2012). In addition, the literature indicates that females tend to visit libraries more often (Simmonds and Andaleeb, 2001) and that young females tend to read more and to seek a variety of information sources (Shahriza Abdul Karim and Hasan, 2007). On the other hand, some studies have found that males generally visit libraries more often than females (Shahriza Abdul Karim and Hasan, 2007; Niu and Hemminger, 2012), or that the two genders use library resources equally (Clark and Hawkins, 2011). Most of the studies that discuss gender and library usage indicate the importance of further investigation (Herrera, 2016; Stone and Collins, 2013).

2.9.2 Disciplines

Discussing the similarities and differences of ISB's disciplines is a challenging task because of the different nature and format of exploratory studies in the literature (Spezi, 2016), besides to the previous reasons that have been mentioned when studying academics ISB. The literature showed many old studies on ISB and disciplines (Ellis et al., 1993; Ellis and haugan, 1997; Meho and Tibbo, 2003; Hemminger et al., 2007).

Most of these studies reflect individual's experience or have a theoretical approach (Sahu and Nath Singh, 2013). Students' ISB have a large body of literature that is diffuse and difficult to understand the general trend of their behavior (Urquhart and Rowley, 2007). Science's ISB has the highest number of studies in the literature compared to other disciplines that have a

case studies investigation on a specific academic institutions or (Ganaie and Khazer, 2014). The most comment trend in ISB’s disciplines is the use of electronic sources (Spezi, 2016).

At the beginning it is important to clarify how the different disciplines have been classified. Biglan has classified the academic disciplines into three groups include hard/soft, pure/applied and life/nonlife disciplines (Biglan, 1973b; Biglan, 1973a; Kuhn, 1970) Figure 4. Hard disciplines include physical sciences and engineering majors whereas soft disciplines include humanities, business, social sciences and education. Pure disciplines include physical sciences, HASS whereas the applied sciences include disciplines with practical sides or applications such as engineering, business and education. Finally, life disciplines such as social science and education while nonlife include physical sciences, engineering, humanities, and business (Whitmire, 2002b).

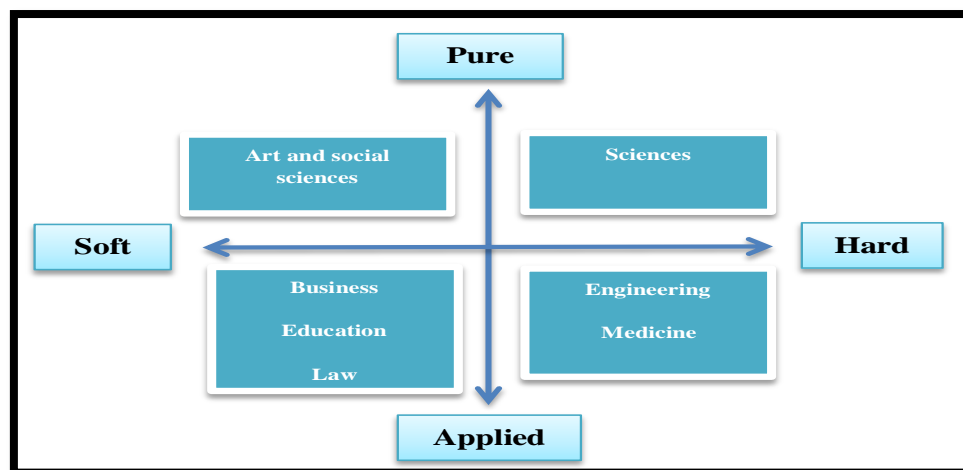


Figure 4: Mapping of Disciplines Biglan (1973)

In the 21st century it has been noticed that there is increasing of cross disciplinary factors and this increase the moving towards inter-disciplinary (Trowler, 2001; Trowler et al., 2012). This increase is a result of economic pressure and dominance of higher education environment (Madden et al., 2018). The second reason is that, most staff and students are using technology across different countries such as Australia, UK and US (Kennedy et al., 2008; Green and Hannon, 2007; Kvavik, 2005; Vijayakumar and Mahadevan, 2018). Between inter-disciplines there are major differences due to several reasons such as different cutlers which can affect usage of electronic resources (Talja et al., 2007). Also, Jamali and Nicholas (2010) mentioned that each fields depend on particular type of information and

adapt a certain approach to find and locate information sources. In addition, the nature and the degree of scattering of particular field (Vakkari and Talja, 2005; Tenopir, 2007). For all the previous reasons ISB of different disciplines can be different.

The following section will discuss similarity and differences in behavior between disciplines. Therefore, it is important to describe the general trend of each discipline then identify the similarities and differences.

2.9.2.1 ISB in various Disciplines

2.9.2.1.1 Engineering

Many studies have discussed the various methods and information resources used by engineering faculty. Leckie et al. (1996) found that engineers tended to use personal documents and personal knowledge, rather than relying on libraries. They also rely on internal information, which includes memories, documents and colleagues (Kwasitsu, 2003). A study has identified personal documents and asking colleagues as among the methods most commonly used by engineering faculty, who are also reported to favour the use of databases, the internet, electronic journals and e-books to seek information (Chaudhry and Al-Mahmud, 2015).

Many other studies (Wellings and Casselden, 2017; Zhang, 2015) confirm that that engineering academics use people, including colleagues considered to be experts (Levine et al., 2011), especially in face-to-face conversation (Ellis and haugan, 1997; Engel et al., 2011), as an important source of information. Conversely, engineers are reported to tend to spend more time searching non-human sources of information (Robinson, 2010).

Tenopir et al (2009a) and Tenopir et al (2009b) found that academic staff in engineering spent more time reading academic journals compared to medical staff and that the time spent was determined by the purposes of reading and the use made of the information by academics in each discipline. According to Levine et al (2011) engineers considered the time needed to access information resources because “time is money”.

A recent study of the ISB of engineering faculty showed their preferred sources of information to be electronic journals, formal and informal (face-to-face) communication (Arshad and Ameen, 2018). On the other hand, they were less likely to use print sources and library print resources. Electronic journals and e-books had equal usage among engineering

academics. They used electronic journals to KUTD and were likely to use online indexing or abstract services. Their main methods of finding articles were searching for them and setting up alerts for particular journals.

2.9.2.1.2 Astronomy and Physics

The literature discusses the ISB of both academic staff and PhD students in the fields of astronomy and astrophysics. There is evidence that academic staff tend to use personal collections, with decreasing numbers of visits to libraries (Sahu and Nath Singh, 2013). They also use e-journals, e-print depositing, email alerts and RSS to KUTD (Sahu and Nath Singh, 2013; Jamali and Nicholas, 2010). Physicists and astronomers in general tend to use citation tracking more than other academics (Brown, 1999a; Nicholas et al., 2006a; Jamali and Nicholas, 2010). On the other hand, a study of Greek physics and astronomy undergraduates found that they were not aware of library services and that they visited the library to access electronic journals. These students preferred to use electronic resources and Google rather than social media. They also took a simple approach to searching for information and used keywords provided by their lecturers (Brindesi et al., 2013).

2.9.2.1.3 Inter-disciplinary ISB

As noted above, there is an increasing tendency towards an inter-disciplinary approach to information seeking; therefore, it is important to consider the meaning of the term before discussing some aspects of inter-disciplinary ISB. Inter-disciplinary research is the integration of studies by researchers who seek to develop new ideas or solutions to problems in one discipline by using methods or theories from related sub-disciplines within one field (Repko, 2005; Youngblood, 2007). Inter-disciplinary activities can be defined as having three elements:

- The adoption of tools, methods and methodologies from multiple disciplines,
- The application of theoretical frameworks from other disciplines,
- The ability to solve problems (Lattuca, 2003).

Inter-disciplinary research results from collaboration and knowledge sharing among researchers in different fields (Jang et al., 2018). It can increase productivity and provide strong ways to deal with complex situations and problems among diverse social phenomena (Porter et al., 2006; Wagner et al., 2011; Van Rijnssoever and Hessels, 2011).

With regard to inter-disciplinary scholars of physics and astronomy, a study by (Jamali and Nicholas, 2010) found that academic staff of physics and astronomy tended to spend more time on searching to KUTD and that they tended to rely on chaining and browsing when seeking information. On the other hand, academics in well-defined fields tended to use keywords to search for information. Inter-disciplinary of physics and astronomy academics tended to use Google, Google Scholar and general databases, whereas those in well-defined fields used TOCs and alert services. In high scatter fields, academic staff used chaining and browsing of electronic journals, in contrast to low scatter fields, where direct keywords tended to be used. As to KUTD methods, academics in inter-disciplinary fields tended to use a variety of methods such as word of mouth, departmental meetings or research groups, conferences, print, electronic sources and TOCs (Jamali and Nicholas, 2010).

2.9.2.1.4 Computer Sciences

Computer science academics are the most frequent users of all types of advanced technology (Hemminger et al., 2007) and are the first adopters of latest developments (Tenopir, 2003); therefore, the speed of change is very high. As a general trend, computer faculty tends to browse conference papers, journals and academics' webpages to keep themselves updated. Both engineering and computer science faculty consider articles a very important source of information and are less likely to use books (Tucci, 2011), perhaps because change is so rapid in this field. Computer academics tend to search for information and prefer to KUTD by consulting well-known authors or researchers via customized search tools (Sieg et al., 2007). They favour backward citation tracking for literature searches and forward citation tracking for specific purposes (Athukorala et al., 2013).

2.9.2.1.5 Mathematics

Mathematicians tend to use the internet in order to find academic journals and books, preferring not to use traditional library collections, according to Sapa et al (2014), who found that their ISB had not changed since a study by Brown (1999a), despite intervening technological advances. They also tended to browse the full text resources, using abstract and index tools, and to search for information on the webpages of individual academics (Sapa et al., 2014). Mathematicians, engineering staff and PhD students use search engines, including Google, as a starting point when they search for information (Zhang, 2015), which can be of any type, even involving very specific terminology (Zhao et al., 2008). A specific searching

behaviour of mathematics staff is to link their publications with personal webpages (Sapa et al., 2014). They also often browse the personal webpages of peers in order to find the latest articles (Spezi, 2016). Overall, they tend to read more than academics in other disciplines (Niu and Hemminger, 2012).

A study by Sapa et al (2014) compared the ISB of staff and students in maths and found that staff tended to monitor, search and browse for information on the internet, whereas students searched for graphics, audio and videos clips using Google. Lack of knowledge and experience led PhD students to rely on objectives and well-known features of scientific information or names of institutions and publishers, whereas staff could distinguish between scientific and non-scientific texts, papers and journals. Therefore, students tended to use institutions' websites and search them more often than staff did. They also used more encyclopaedias, dictionaries, search engines and multimedia. Finally, younger students tended disproportionately to use keywords, social media and library websites (Sapa et al., 2014).

2.9.2.2 Social Sciences ISB

PhD students in the social sciences and humanities tend to use library resources more than those in other disciplines (Catalano, 2013). A study to develop an integrated model of social sciences and humanities ISB at Sultan Qaboos University in Oman showed that staff tended to visit the library when they had time and that they used online library catalogues more than other disciplines (Al-Suqri, 2011). Social science PhD students also used library resources and evaluated online cataloguing more favourably than other disciplines (Catalano, 2013; Spezi, 2016). The variety of information resources that have been used include books, journals, electronic journals, personal collections, colleagues and experts in the field (Given and Willson, 2017).

There is copious evidence that social science and humanities staff prefer print and other traditional information resources over electronic ones (Brown and Swan, 2007; Warwick et al., 2008; Tahir et al., 2010; Kachaluba et al., 2014; Trace and Karadkar, 2017); this is also true of PhD students (Baruchson-Arbib and Bronstein, 2007; Brown and Swan, 2007; Rimmer et al., 2008; Martin and Quan-Haase, 2016). However, traditional methods such as visiting a library and using archives are declining in popularity as academics adopt new technology including electronic resources in their ISB (Borgman, 2009; Tahir et al., 2010;

Bulger et al., 2011; Kachaluba et al., 2014; Chrzastowski and Wiley, 2015). This change in behaviour is a result of academics seeking to cope with the academic environment and to meet their research needs by adopting tools to suit their work patterns (Given and Willson, 2017). It is also simply true that electronic resources make information gathering easier (Khan et al., 2011).

Other studies have found that social science and humanities staff relied on both internal and external communication with colleagues for information exchange (Al-Daihani, 2003; Ashokbhai Bhatt, 2014) and that they KUTD by browsing library resources and using citations (Baruchson-Arbib and Bronstein, 2007).

2.9.2.2.1 Law

A study of ISB in the law faculty of an Indian university reports that staff preferred online library resources over print, using both internet tools provided by their institution and search engines such as Google (Ashokbhai Bhatt, 2014). Elsewhere, academics preferred to seek help from a librarian, finding it difficult to search for legal information using electronic sources (Thanuskodi, 2010). Books, journals and law reports were the most important information resources (Thanuskodi, 2009). As for law students, they used both print and electronic sources, the internet being the main method (Kadli and Hanchinal, 2015; Abbas et al., 2014).

2.9.2.3 Similarities between Disciplines

It can be seen that there are more similarities than differences in ISB. Similarities have been found between science disciplines and sub-disciplines, as well as between sciences and social sciences.

2.9.2.3.1 Search Engines and Disciplines

Use of the internet and electronic resources has become part of everyday life and they were used across all disciplines (Niu and Hemminger, 2012). Thus, search engines, of which Google is the most popular (Krawczyk, 2014), have replaced the library as the first choice of information source (Baase, 2012; Ruthven and Kelly, 2011). However, library homepages are also popular and academics tend to use both search engines and library webpages to find full text articles (Niu et al., 2010; Carpenter, 2012; Inger and Gardner, 2013; Tenopir et al., 2015).

Wellings and Casselden (2017) found that search engines, databases and Google Scholar were the methods most often used by both engineering and science staff. The use of search engines was also common behavior among other scientific disciplines (Haglund and Olsson, 2008; Jamali and Asadi, 2010; Sahu and Nath Singh, 2013), because of their ease of use, convenience and accessibility (Anderson et al., 2001). Academic staff preferred multidisciplinary information sources over specific ones and the most popular were Google Scholar and Web of Science (Hightower and Caldwell, 2010). Besides providing various information resources (Arshad and Ameen, 2018), Google uses different systems including search algorithms to rank search results (Baase, 2012; Sullivan, 2015). These features allow users to recall documents relevant to their keywords (Yu, 2016). Google also offers automated recommendations which help researchers to narrow the scope of areas to be investigated (Evans, 2008; Scheitle, 2011). Google is used in some sub-disciplines to search for new information, whereas in other disciplines, such as earth sciences and astrophysics, it has a different level of usage (Meyer et al., 2011). It has been found that academics across all disciplines who tend to use Google do not maintain a collection of articles, which means that they do not utilize software such as Endnote or RefWorks to manage their references (Niu and Hemminger, 2012).

2.9.2.3.2 Academic Journals and Disciplines

Academic journals were widely used in conducting research and in scholarly communication (King et al., 2009; Tenopir et al., 2009a; Nicholas et al., 2010b; Tenopir et al., 2012b). Indeed, it has been found that academics consider them to be the primary source of research-related information (Brown, 1999b; Carpenter, 2012). Furthermore, academics tend to use webpages and personal networks to communicate with peers and identify academic information by using academic journals (Niu et al., 2010). Science faculty tend to read more articles, especially in the medical and life science disciplines (Tenopir et al., 2015).

Overall, academics in the sciences and social sciences have been found to use the same information resources and retrieval methods and to face similar obstacles when dealing with information (de Tiratel, 2000; Skelton, 1973). Sheeja (2010) found that staff in these disciplines depended on electronic journals to keep up to date. Those in the sciences tended to consult conference papers to KUTD, whereas social scientists preferred print journals, with most disciplines depending on both print and electronic formats for reading (Niu and Hemminger, 2012). Nicholas et al (2017) investigated how early career researchers in seven

countries (UK, USA, China, France, Malaysia, Poland and Spain) used and shared information, reporting that databases were used as the starting point to search for references (Borrego and Anglada, 2016; Housewright et al., 2013a). Staff and PhD students considered emails, online catalogues, electronic journals and databases as important information sources (Ge, 2010). Moreover, staff preferred general databases over subject-specific ones (Hightower and Caldwell, 2010), because of an increase in inter-disciplinary research.

Borrego and Anglada, (2016) found that academic staff saw the library as the main way to access electronic resources, but they perceived the role of academic libraries as less effective than in the past and a minority of them wanted to see essential changes in the role of the academic library.

Among the studies reporting no significant differences between the physical and social scientists, Ellis (1989) used ground theory to describe the ISB of social scientists, physicists and chemists. It found few differences between subject groups on five features of academics' ISB: initial familiarization, chasing, source prioritization, maintaining awareness and locating. A later study by Ellis on academic research added more activities, such as verifying and writing (Ellis et al., 1993).

2.9.2.4 Differences in ISB among Disciplines

Differences in academics' ISB between disciplines can arise from several factors. Research cultures can differ from one discipline to another and can affect the use of electronic resources (Talja et al., 2007); each discipline relies on particular types of information resources and certain search techniques (Jamali and Nicholas, 2010); and the nature and scatter of the literature in each field can affect ISB (Tenopir, 2007; Vakkari and Talja, 2005).

Prasad and Tripathi (1998) found many significant differences between physical and social scientists including the sources they used, their information-seeking approaches and their information needs. Science students tend to use Google Scholar more, while social science students tend to search for information by author name, title and keywords (Wu and Chen, 2014). In high-scatter disciplines, staff often use chaining and browsing, as well as Google Scholar and general databases, while those in low-scatter disciplines depend on direct keywords (Jamali and Nicholas, 2010). In terms of format, science staff tend to prefer to read electronically, whereas social scientists depend more on print (Niu and Hemminger, 2012). In general, it has been found that the more specialized the field, the more specialized the search

tools. Conversely, more general search tools are preferred for inter-disciplinary research where the literature is scattered (Jamali and Nicholas, 2010). The literature indicates that students in pure disciplines have less confidence in using technology compared to those in applied ones. On the other hand, there were no significant differences in confidence between soft and hard disciplines (Lam et al., 2014) Table 1.

In conclusion, most of the studies of the ISB of academic staff in the literature have investigated single disciplines and there are few comparisons between two or more disciplines. Most also examined the ISB either of PhD students or of staff, while those considering both groups are limited. In terms of methodology, most studies of academics' ISB used questionnaires to collect data, with mixed methods tending to be used more in workplace environments than in studies with a focus on either academics or PhD students.

Similarities	Differences	
Using internet	High scatter	Low scatter
Using search engines	Chaining and browsing	Direct keywords
Google scholar	Reading Format	
Academic journals	Sciences	Social sciences
Both internet and library webpage	Electronic format	Print format
Multidisciplinary resources		
Databases		
Personal networks		

Table 1: General Trend of Similarities and Difference of ISB among Disciplines

2.9.3 Age

Patterns and habits of academics' KUTD can be analysed by investigating potential differences in attitudes and preferences among different age groups. Although age can influence individuals' behaviour and their choices of methods, there is a very limited literature discussing the impact of age on ISB (of which KUTD is one aspect). Hence, it is important to gain more knowledge and understanding of the relationships of age differences to academics' information needs and the challenges they face in keeping themselves updated. Doing so will fill a research gap in this area and could help in designing better training to help in dealing with a rapidly growing body of information in the academic environment.

Many researchers have addressed a range of relevant topics in the literature, including age differences in searching online for information (Chevalier et al., 2015; Queen et al., 2012; Karanam and van Oostendorp, 2016). Children and age are both discussed widely, e.g. by

Palaiologou, 2016; Rudi et al., 2015; Ihmeideh and Shawareb, 2014). Older adults, elderly people and the impact of age are considered by (Sanchiz et al., 2017; Ramón-Jerónimo et al., 2013). Age has been explored in relation to seeking non-academic information such as in online shopping (Yoon and Occeña, 2015; Fang et al., 2016) and health (Silver, 2015; Tennant et al., 2015). For example, Chang et al (2017) found that among Singaporean women, health ISB varied with age.

Most of the previous studies have focused on online information seeking in different contexts. Helsper (2010) found internet usage to be affected by many different socio-demographic factors such as income, age and education level. Other studies have explored the digital divide across different age groups (Lee et al., 2011; Wei, 2012; Smith, 2014). The literature indicates that the ISB of younger individuals differs from that of older people.

A few studies have found that age affects some of the methods used by academics to KUTD. Nicholas et al. (2005) investigated the ISB of staff and PhD students of physics and astronomy at University College London (UCL) and found that older academics depended more heavily on interpersonal communication than younger ones to KUTD and that those aged 60 and over tended to depend on conferences. Also, a study of astronomers and astrophysicists in India, by Sahu and Nath Singh (2013) found similar results. The potential reasons for this behaviour are longer academic careers and wider connections with experts in their field (Jamali and Nicholas, 2008). By contrast, the UCL academics aged between 35 and 39 depended primarily on e-print and email alerts. Similarly, Robson and Robinson (2013) found that academics under 30 years of age tended to rely more on electronic resources and to seek expert recommendations, because of relative unfamiliarity with their field.

Some studies have also shown that academics' ISB varies with age. A study in Slovenia found that those aged between 20 and 40 years tended to use electronic resources, whereas older academics (40-60 years) used both electronic and print resources (Vilar et al., 2015). Pontis et al (2015) found that older academics tended to use electronic resources and to discuss similar interests with other experts in the field.

The Vilar et al (2015) study also indicated that younger academics tended to share citations of electronic information sources, while those aged over 60 were the least enthusiastic towards using electronic sources and rarely shared citations or used open access. Academics also reported having insufficient time for communication with peers. The reason for this behaviour may be that they are new adopters of technologies (Vilar et al., 2015). For

example, older academics in senior positions tend to use Web 2.0 applications (Procter et al., 2010).

Overall, it has been found that age and experience will increase academics' ability to find the required information (Restoum and Wade, 2013). Therefore, the relationship between age and ISB can be either positive or negative, depending on each user's IT skills (Restoum, 2016).

2.9.3.1 Library use and Age

Increasing age has been found to correlate with fewer visits to the library (Williams and Rowlands, 2010). Younger academics tend to use the internet more than the library when compared to older academics (Superio, 2018; Niu and Hemminger, 2012); however, postgraduates and PhD students also spend more hours logged in and accessing information via library webpages (Restoum, 2016).

Overall, few studies have investigated the influence of age on the use of different ISB methods. Those findings which are reported in the literature apply to particular contexts or disciplines and cannot be generalized. Furthermore, most of the published studies of age and ISB lie outside the scope of the present research.

2.9.4 Position and Experiences

This section considers academics' experience and position as factors affecting ISB. There is a strong relationship between position and experience, as those occupying higher positions are likely to have longer experience. Extensive subject experience leads to wide domain knowledge, which can be defined as a searcher's knowledge of a subject area or topic (Wildemuth, 2004). Experience and ISB are discussed widely in the literature by (Ellis and Haugan, 1997; Kuhlthau, 1999; Meho and Tibbo, 2003; Warwick et al., 2009). Those investigating search and domain knowledge include (Chu and Law, 2007; Pontis and Blandford, 2015), while many others have compared expert and novice users of information systems (Hölscher and Strube, 2000; Vakkari, 2002).

This study uses the UK academic rankings of Strathclyde University to define academic positions at seven ascending levels: PhD student, Research associate, Research fellow, Lecturer, Senior lecturer, Reader and Professor (Section 5.7 Research Population). Palmer, 1991a; Sapa et al., (2014) are among many studies in the literature investigating whether position can affect ISB. Sahu and Nath Singh (2013) mention position but do not report

associated differences in behaviour, whereas Niu and Hemminger (2012) analyse a series of surveys of 2,063 academics in natural science, engineering and medical science at five US universities and claim that position is an important factor that can affect ISB. In a study that investigated the ISB of a team of senior and junior physicians at an African university hospital found that position affected the methods of accessing information (Isah and Byström, 2016).

Pancheshnikov (2007) and Larivière et al (2013) found that junior researchers and PhD students tended to read more and cite more papers than senior academics, while Ge (2010) reports that PhD students and assistant professors used electronic resources more than professors and associate professors. Similarly, Jamali and Nicholas (2006) found that PhD students were more likely to browse electronic journals than senior academics in a physics department. They also report that senior academics tended to rely on interpersonal communication and conferences to KUTD, whereas PhD students depended on alert services. Other studies have found that academic staff preferred informal methods of communication over formal ones (Kuffalikar and Mahakulkar, 2003) and that PhD students used the web to search for information and considered references suggested by the academic staff to be more reliable (Catalano, 2013).

A study by Niu and Hemminger (2012) determined that compared to junior professors, senior professors tended to retrieve more information and to have more library subscriptions and personal subscriptions to electronic journals. The authors also state that associate professors were more confident than PhD students when searching for information, concluding that level of experience and competence in information searching both affect academics' ISB. Finally, the study found that staff who used Google tended to be less confident than those who used library webpages.

Among the many studies addressing citation and referencing behaviour are (Case and Higgins, 2000; Bornmann and Daniel, 2008; Hellqvist, 2010). A few authors have discussed experience and referencing behaviour. More senior academics tend to choose a limited number of documents and to read and cite more (Wang and White, 1999). A study found that senior LIS staff tended to use fewer and older references (Milojević, 2011). By contrast, PhD students tend to cite younger scholars and a wide variety of references in different fields (Barnett and Fink, 2008; Sugimoto, 2012). They may cite a variety of references as a result of their supervisors' inter-disciplinary background; however, few studies in the literature have

investigated whether staff and students differ in referencing behaviour (Sugimoto et al., 2011; Larivière et al., 2013).

In terms of domain knowledge and finding information, a study of academics' KUTD over time found that as their subject knowledge grew, they became increasingly familiar with the most relevant information resources (Pontis et al., 2015). However, while a higher level of subject knowledge can make staff aware of the most important journals and key authors in the field, at the same time their desire to KUTD will decrease. The study also found that level of seniority determined the different methods used to search for information. For example, the web searches of junior academics with little experience tended to follow senior colleagues' suggestions, because they lacked confidence in using electronic information resources (Robson and Robinson, 2013). Conversely, senior and experienced staff can identify essential information resources and discuss similar interests with peers (Pontis et al., 2015). Interaction with peers can provide a good opportunity to identify in-depth information and enrich knowledge in their field. Perspectives on KUTD differ because junior staff find it difficult to filter information appropriately and therefore rely on the suggestions of senior academics, who themselves do not have enough time to read everything. Thus, while being aware of general trends in the field, senior staff tend not to be active in keeping up to date with the latest developments (Pontis et al., 2015).

Overall, the literature shows that the ISB of academic staff has not been investigated comprehensively, although it is mentioned as part of various empirical studies.

2.10 Summary

The above review of literature on factors affecting ISB indicates that to date there has been no research into factors that could affect KUTD, which can be considered one of the knowledge gaps that the present research aims to address. Understanding factors that affect information behaviour and KUTD will help to design and provide the services that are more appropriate for users.

Studies reported in the literature discuss the ISB of students much more than that of staff (Ganaie and Khazer, 2014; Vezzosi, 2009; Korobili et al., 2011; Spezi, 2016), whereas the present research includes both staff and PhD students, for the following reasons. These two groups engage in similar academic activities, as both are responsible for knowledge creation and information dissemination; therefore, studying both groups allows a wider picture of the

KUTD behaviour in the university to be produced. On the other hand, the research excludes both undergraduates and master's students, because their information-seeking skills are not yet fully developed due to a lack of field-specific knowledge. Their ISB also differs from that of academics in that master's students are still in the process of learning how to conduct research and their dissertations are not written in as much depth as a PhD thesis. As to undergraduate students, they tend to cope more than to seek information (Barrett, 2005), so it is reasonable to assume that they are still in the process of building basic knowledge in their respective fields and are not likely to know on exactly which aspects of any particular topic they need to keep themselves updated. This matter is discussed in more detail in (Section 5.8 Questionnaire Sample).

The present research attempts to bridge the gaps revealed by the literature review in the following ways. Firstly, it investigates a specific phenomenon: keeping up to date. Secondly, it does so from two perspectives: those of the service provider (the library) and of the service owners (the users), in an attempt to determine the ideal approach to keeping updated. Thirdly, it considers the effects of individual differences such as age, gender, faculty, experience and position, in two groups of users: academic staff and PhD students. It takes a mixed quantitative and qualitative approach to data collection from several different faculties, namely engineering, science, and social science and humanities, since a number of authors warn that a narrow focus on one field can be considered a limitation (Zhou, 2014; Maghferat and Stock, 2010).

2.11 Methods Academics use to KUTD

This section discusses the various KUTD methods that have been investigated in previous studies and used by academics. These tools and the factors affecting their usage are examined under three main headings: social media, citation and alert services.

2.11.1 Social Media

Academic research is a social activity that involves communicating and sharing information with other academics. Academic communication can be defined as a process that allows scholars to communicate with each other in order to create new knowledge and to evaluate their work before transmitting it to the broader community (Thorin, 2006). There are now many formal and informal communication channels that academics can use; the formal ones

include digital repositories and open access publishing (Shehata et al., 2015b), while the informal channels include blogs, wikis and social media networks (Collins and Hide, 2010; Allen et al., 2013). Social media networks are:

“Web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system” (Ellison, 2007).

Users of social media platforms navigate content lists, share information and experience and build up networks or relationships for social or educational purposes (Jiao et al., 2015).

The topics discussed in the literature include the advantages of using social media, academic performance and academics' use of the different social media networks such as Research Gate and Academia.edu (Kelly, 2013; Bullinger et al., 2010; Bollen et al., 2009; Haustein et al., 2014). Many studies refer to the importance of these networks for knowledge acquisition, creation and transmission (Tynjälä and Nikkanen, 2009; de Lima, 2010; Letierce et al., 2010; (Rowlands et al., 2011). In particular, social media networks are considered to be important tools for scholarly communication and information sharing (Schonfeld and Housewright, 2010; Osatuyi, 2013; Sobaih and Moustafa, 2016). However, there have been a limited number of studies of academic social networks (Thelwall and Kousha, 2014). Moreover, they have focused on the use of metrics such as numbers of views, downloads and followers to evaluate academic impact (Ortega, 2015b; Kousha et al., 2010; Eysenbach, 2011; Priem et al., 2012).

Among other reasons mentioned in the literature for staff and PhD students to use social media are learning more about other research communities outside their own institutions and keeping up to date with developments in particular fields (Niu et al., 2010; Procter et al., 2010). In addition, Cann et al (2011) reports that academics find that using social media can alleviate the feeling of information overload and enhance their research capacity by making them aware of general trends and helping them to use their time effectively. Furthermore, academics use social media at all stages of research, such as identifying new research opportunities, finding potential collaborators, reviewing the literature, collecting data and disseminating findings (Cruz and Jamias, 2013). Finally, social media provide alternative ways to publish academic work and facilitate more formal methods of publication such as academic journals (Collins and Hide, 2010; Kirkup, 2010).

Despite all of the above reasons for using social media and despite being aware of a trend away from formal channels of academic communication, academics generally use these informal communication channels relatively little (Shehata et al., 2015b). Their adoption is still not widely accepted in the academic environment (Weller, 2011). Thus, a study in the UK and USA found that only 2.5% of academics had created Twitter accounts (Bik and Goldstein, 2013). A year later, only 1,517 cited authors in different social media sites, which reflects their low adoption by academics (Mas-Bleda et al., 2014). Other studies have reported limited use of social media by academics (Shehata et al., 2015b; Forkosh-Baruch and HersHKovitz, 2012).

The slow adoption of social media among academics may be explained by a number of factors. There are privacy concerns, especially in the light of claims that the main social media networks collect users' data and use it for commercial purposes (Debatin et al., 2009; Hargittai, 2010; Au and Lam, 2015). Secondly, academics see social media as a source of entertainment and a cause of distraction, doubting their value as information resources (Phillips, 2011). They are also concerned by the preponderance of grey literature which is of no use in academic research because it is not peer reviewed (Seymour, 2010). Finally, some mobile devices do not support social media tools, which means that some functions may not be active (Au and Lam, 2015).

Those academics who do embrace social media tend to use specialised ones that support research activities, called academic social network sites (Oh and Jeng, 2011). Among these, the most popular are Research Gate (RG) and Academia.edu (Nicholas et al., 2015). Although the literature treats both RG and Academia as social media networks, the present research considers them to be academic tools or methods for the purposes of the questionnaire, because of their heavy use by academics. The following subsections nevertheless discuss RG and Academia before turning to some mainstream social networks also used by academics.

2.11.1.1 Research Gate

Research Gate is considered academics' "preferred network platform" (Crawford, 2011), because of its proprietary reputation metrics, which depend on bibliometrics and scientometrics (Thelwall et al., 2013). RG provides many different indicators that help users to evaluate documents or articles, including:

- Social measurements, showing followers and following;
- Metrics such as numbers of page views and downloads;
- Bibliometric indicators, such as
 - Impact points, the total value of impact factor of the journal in which a paper is published and
 - Papers and citations;
- The RG score, a compound index of all of the above indicators (Shrivastava and Mahajan, 2015; Ortega, 2015b).

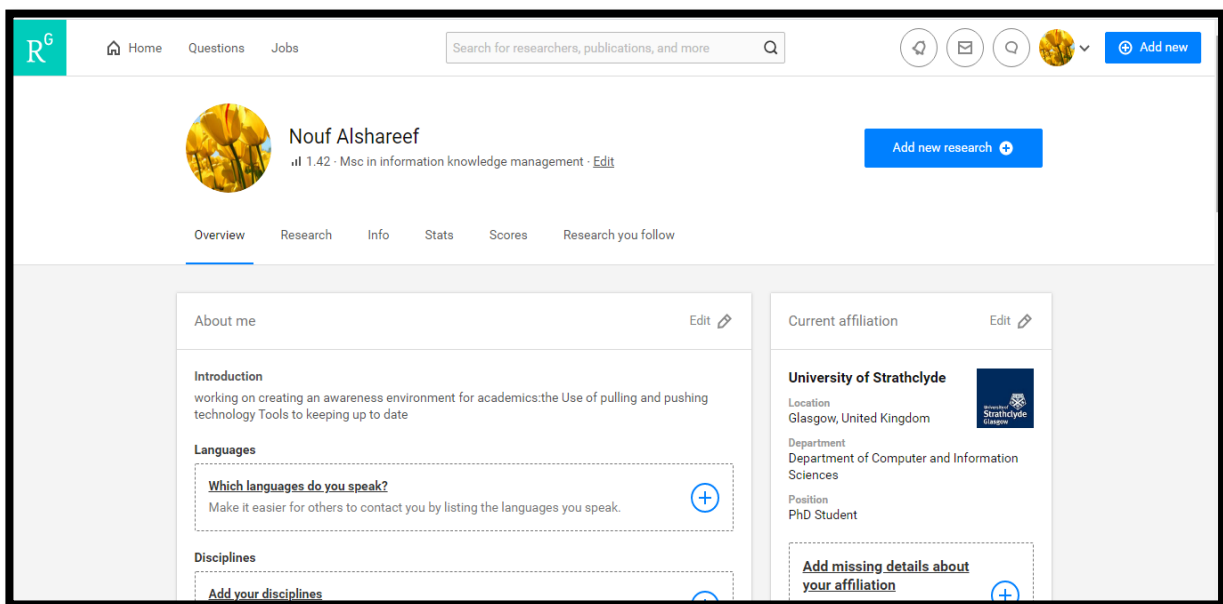


Figure 5: Research Gate Homepage

RG provides many options that allow users to share information, to contact and work with other academics in the field and to find work opportunities (Shrivastava and Mahajan, 2015). It also has a question-and-answer feature which invites user to help each other to solve problems, increases serious competition and encourages collaboration (Manca, 2018). Finally, users can monitor recent activities and KUTD with recently added papers or articles (Ovadia, 2014).

2.11.1.2 Academia.edu

Academia.edu is a platform where users can find academic webpages (Duffy and Pooley, 2017), academic research networks and general social networks (Thelwall and Kousha, 2015). Its homepage provides functions such as a newsfeed, which updates users with uploaded documents and other user's activities (Manca, 2018). The metrics used to provide information for users include how many times a profile, document, search or keyword has been viewed or used (Ovadia, 2014). Academia also offers suggestions based on similar research areas or academic interests to increase network connections and allows each user to communicate with peers by creating a page where they can add comments and feedback (Manca, 2018). In addition, users can post questions to the platform community and receive notification if answers have been provided (Thelwall and Kousha, 2014).

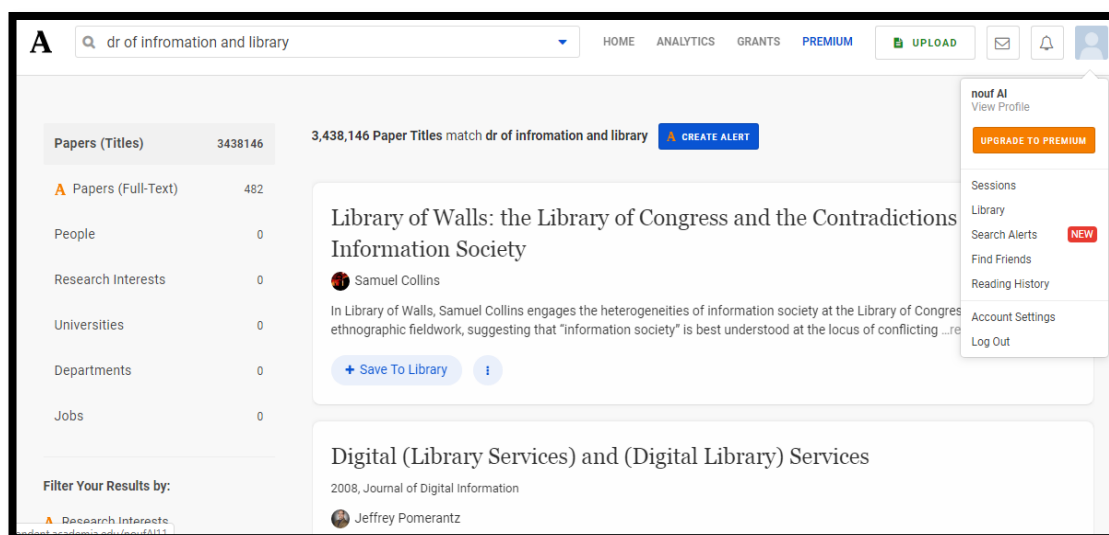


Figure 6: Academia Homepage

A study of the usage of Academia among academics and students in different disciplines found that humanities scholars used it more than others to share citations, ideas and academic works. Senior academics tended to be more active users than junior academics because their profiles and experience attracted more users. No gender differences in usage were detected (Thelwall and Kousha, 2014).

Both Academia and RG use the following model, where users can follow other users and their activities and academics can use the platform free of charge (Ovadia, 2014).

2.11.1.3 Twitter

Twitter is a tool used to communicate with others using a limited number of characters (originally 140 or fewer) (Priem and Costello, 2010). As well as sharing information, it can also be used to visualize conversations in real time during online conferences (Sopan et al., 2012; Ross et al., 2011). Academics use it to communicate with peers and promote academic works (Letierce et al., 2010), or to contact senior academics (Weng et al., 2010). The hashtag feature allows academics to share particular information or topics very easily and quickly (Weller et al., 2011; Desai et al., 2012). Twitter can be used to cite academic articles as mentioned in many studies such as (Terras, 2012; Weller; Dröge and Puschmann, 2011; Zahedi, Costas, and Wouters, 2014). therefore, scholarly impact can be measured (Priem and Costello, 2010). It has been found that 6% of tweets include URL links to academic articles or webpages (Holmberg and Thelwall, 2014). In general, only 3% of tweets are retweets, whereas among academics they constitute 27% (Boyd et al., 2010).



Figure 7: Twitter Homepage

Holmberg and Thelwall (2014) investigated Twitter usage among different disciplines by analysing selected tweets and found that humanities scholars used Twitter more than people in other disciplines and that senior academics in biochemistry, astrophysics and the humanities tended to use it to communicate with peer. On the other hand, there were limited scholarly communications in sociology, while it was difficult to analyse Twitter use in

economics, because many users other than academics will share and discuss economic information (Holmberg and Thelwall, 2014). The researchers also found that cheminformatics, history of science and sociology were the subject of many non-academic Twitter conversations (Holmberg and Thelwall, 2014). The authors conclude that while academics use Twitter to communicate, most of what they share is relatively general information about the sciences. They acknowledge the limitations of their sample size and call for further investigation of cross-disciplinary differences in using Twitter (Holmberg and Thelwall, 2014). This is consistent with the earlier recognition of the need for qualitative research to determine in greater depth why academics in particular disciplines use Twitter and what benefits they gain (Priem and Costello, 2010).

2.11.1.4 Facebook

Facebook was launched in 2004 by Mark Zuckerberg, who was then a student at Harvard University. It was designed as an online directory to connect people at colleges and universities through social media networks (Zuckerberg, 2005). Facebook allows users to create virtual networks and enables them to customize their interfaces, share their pictures and personal interests and interact and communicate with others (Lashinsky, 2005; Nadkarni and Hofmann, 2012; Kirschner and Karpinski, 2010).

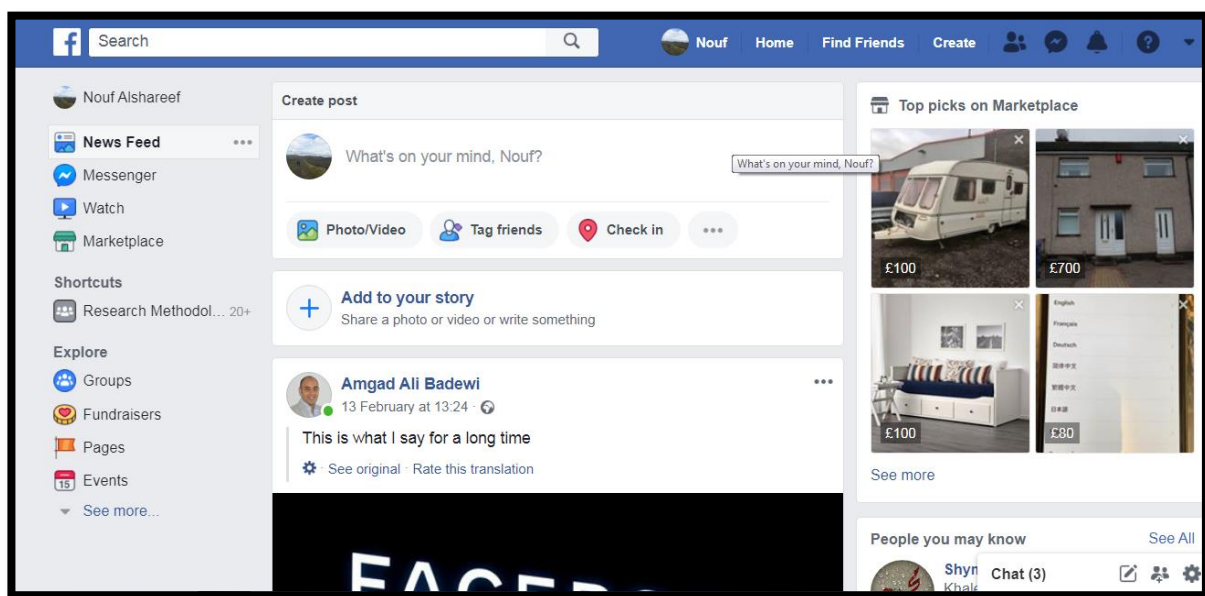


Figure 8: Facebook Homepage

Academics use Facebook to announce new articles or academic work (Kortelainen and Katvala, 2012). There is no clear information about differential use of Facebook among academics or students, but junior academics have been found to use social media networks more (Dutton and Blank, 2011). The limited information about academics' use of Facebook can be justified by the fact that its features support social interactions in general; therefore, academics tend to use it as a platform for more personal communication.

2.11.1.5 Social Media and different Disciplines

A study of researcher's use of social media sites at the Spanish National Research Council found cross-disciplinary differences (Ortega, 2015a). Consistent with earlier research, HASS academics were more active on Academia (Almoussa, 2011; Thelwall and Kousha, 2014), whereas biology and biomedicine researchers used RG more than other disciplines (Ortega, 2015a; Ortega and Aguillo, 2012). It has also been found that HASS staff tend to follow other academics and people whom they do not know or have not met personally (Jordan, 2014). Science academics in general are frequently the first to adopt and use social media (Dubini et al., 2010). It is unclear why this behaviour occurs and whether superior IT skills play a role (Gruzd and Staves, 2011). It should also be remembered that in the academic environment, there is considerable dependency on peers to disseminate information, share knowledge and seek new collaborations (Cronin, 2003; Letierce et al., 2010). Furthermore, it has been found that most of the comments about new journals that are made in blogs and social media result from multidisciplinary work (Costas et al., 2015).

Meanwhile, depending on social network sites is rightly generalized as a way to determine whether a discipline is active or not (Ortega, 2015a). Academics are very active in uploading their papers onto different social media networks and their inactivity is part of self-archiving (Björk et al., 2010; Spezi et al., 2013). For example, biomedical academics are not active on these sites, although most of them use RG (Ortega, 2015a). On the other hand, some disciplines are characterized by high usage of certain indicators; for example, natural scientists use social contacts and browse papers (Rowlands et al., 2011). The behaviour of the various disciplines on social media sites depends on the platform, the characteristics of the field and its nature in general (Jordan, 2014). Therefore, the high usage of social media in the humanities and social sciences is a result of generally being active on these platforms. Academics in non-experimental disciplines have a stronger preference to discuss different topics in forums than those in experimental disciplines (Ortega, 2015a). Finally, Academia

carries a list of HASS publications, which means that social media are not appropriate to measure academic productivity (Ortega, 2015a).

2.11.1.6 Gender, Age and Social Media

Many authors report that females tend to use social media networks more than males (Thelwall, 2008; Thelwall et al., 2010; Brenner, 2013), while others have found no such gender differences among academics (Thelwall and Kousha, 2014). Likewise, a survey of 2000 academic staff indicated that age was not a strong indicator of social media usage (Rowlands et al., 2011). However, Procter et al (2010) found junior academics to be more active on social media, while senior academics tended to use Web 2.0 tools more. Senior academics are also reported to be first adopters and users of social media (Birnholtz et al., 2010). Moreover, because of their experience of publishing via traditional channels, they are more active in using social media to publish their academic work, whereas junior academics tend to rely on tradition channels such as academic journals (Gruzd and Staves, 2011).

In summary, academics tend to use social media for social interaction and dissemination, besides keeping updated. Most studies that have investigated these different purposes have not discussed in detail the factors that affect academics' use of social media. Furthermore, there has been limited research into social media in academia in general and where such studies have focused on a particular social media tool, they have simply reported the different purposes for its use. Work on identifying the effects of factors such as age, gender and discipline on academics' use of such tools has been very limited and remains incomplete. Besides, there has been no comparison of the effects of these factors among social media tools. In general, there have been some attempts to understand the use of social media in an academic context, but it lacks a comprehensive examination of different types of ISB, such as active versus passive.

2.11.2 Citation

Earlier sections of this review have mentioned the use of citation information by staff and PhD students, such as when discussing models, the behaviour of staff and PhD students, disciplines, position, experience and social media. This section offers a general overview of the use of citations, summarizing the most important points drawn from the literature. It is notable that the literature does not discuss the use of citation as a KUTD method.

Many publishers monitor scientific literature by counting downloads and citations (Halevi and Moed, 2014). Libraries and publishers also use these data to evaluate the use of articles or collections (Duy and Vaughan, 2006). Certain authors have discussed the relationships between citations and downloads to measure research impact (Schloegl and Gorraiz, 2011; Gorraiz et al., 2013). Others have considered the roles of factors such as gender (van Arensbergen et al., 2012), networks (Badar et al., 2013) and seniority (Mishra and Smyth, 2013) in the assessment of academic productivity.

Among the well-known methods of conducting a systematic literature review is snowballing or citation chaining, involving both backward and forward citation (Athukorala et al., 2013). Some studies have evaluated citation chaining as an effective method used by academics to search for information (Talja et al., 2007; Jalali and Wohlin, 2012). It has been found that academics who publish high quality papers and those who work in large authorial teams are more frequently cited by others (Bosquet and Combes, 2013). Google Scholar provides a forward citation option, while the Association for Computing Machinery (ACM) the digital library supports backward citation (Athukorala et al., 2013).

2.11.2.1 ISB and Citation Behaviour

Many contributors to the literature have explored the motivation for using citations, focusing on different ways of using citations and why academics choose particular references (Case and Higgins, 2000; Bornmann and Daniel, 2008; Hellqvist, 2010). Wang and White (1999) investigated the relationship between information seeking and citing, reporting that academics with long experience tend to choose fewer articles, read more and cite more (Frandsen and Nicolaisen, 2012). In addition, information seeking, academic aging and references can affect each other, which allows for triangulation (Wang and White, 1999).

Studies of the different characteristics of citation practices with a general focus are rare (Larivière et al., 2013). For example, an attempt to address this gap by investigating citation practices in library and information science discovered a relationship between the age and seniority of academics by which senior authors tend to use fewer and older references (Milojević et al., 2011). The study also found a correlation between high levels of re-citations and author productivity. Other studies have examined referencing patterns in different fields but these have focused on age, the language of the documents, the number of references and the most cited documents (Creaser et al., 2011).

Some studies have suggested that there are differences in citation behaviour across disciplines (Nederhof, 2011; Creaser et al., 2011). Most of these have examined graduate and PhD students' use of information resources to develop library collections (Wu and Chen, 2010) (Kumar and Dora, 2011). The factors considered have been age, language, format, disciplines of cited documents and most cited authors (Feyereisen and Spoiden, 2009; Conkling et al., 2010; Sugimoto, 2011; Smyth, 2011). Most of these studies have focused on one discipline and have not compared citation behaviour across disciplines (Larivière et al., 2013). However, Kushkowski et al (2003) report that the number of citations can vary across disciplines.

2.11.2.2 Google Scholar and Citation

GS is a free academic web search engine which indexes a variety of academic literature in different disciplines, languages and types of information sources (Ortega, 2014). It provides valuable services such as accessing full texts and counting the citations made of each document (Martin-Martin et al., 2017).

Studies of GS as an academic search tool in the library sector can be categorized into three stages. Those in the first stage observed GS with curiosity, then there were more systematic and critical studies. Finally, there were those that focused on the availability of GS, which provides 100% of online information sources (Howland, 2010). The literature also discusses how different users such as academics and information professionals can determine the quality and usefulness of Google Scholar (Carpenter, 2012; Schonfeld and Housewright, 2010; Ettinger, 2008). Other studies have compared GS with other search tools such as library catalogues and bibliographic databases (Gehanno et al., 2013; Ştirbu et al., 2015).

GS provides citation counts which can be used to evaluate academic research activity (Torres-Salinas et al., 2009; Harzing, 2013). This feature has been compared with other citation indicators such as WoS and Scopus (Bar-Ilan, 2010; Kousha et al., 2011; Aguillo, 2012). GS can provide statistics on academic impact in disciplines that use different channels of scholarly communication, such as humanities, social sciences and engineering (Kousha et al., 2011; Martín-Martín et al., 2016). It also provides a wide range of cited and citing articles, books, policy reports and working papers (Bosquet and Combes, 2013). The variety of academic works that GS indexes (De Winter et al., 2014) make it an important source for

KUTD in the present research. In addition, it is considered to be the best tool for comparison of citation counts between disciplines (Amara and Landry, 2012; Harzing, 2013).

Compared with other citation indicators, GS has the widest scope of academic publications, including books, academic journals and reports (Martin-Martin et al., 2017; Harzing and Alakangas, 2016), whereas WoS and Scopus are both limited to academic journals (Bosquet and Combes, 2013). A disadvantage of GS is that it tends to post items multiple times under different titles, publisher names, parts or chapters, which can lead to errors in citation counts (Bosquet and Combes, 2013; De Winter et al., 2014). Another distinction is that WoS and Scopus provide a selection of relatively similar citation sources, whereas GS is less selective (Bosquet and Combes, 2013). Furthermore, unlike WoS or Scopus, GS lacks the means of identifying highly cited documents (De Groote and Raszewski, 2012), which indicate most influential academic works, thus identifying the most influential authors, research methods and topics (Martin-Martin et al., 2017). There is no restriction on the number of citations received in WoS, whereas in GS there is a maximum of 1000 results, making WoS more reliable (Martin-Martin et al., 2017). Therefore, GS's ability to identify highly cited documents needs more investigation. However, Martin-Martin et al (2017) claim that GS is capable of identifying highly cited documents and justify this as follows:

- Matching document languages by considering geographical web domains with a user interface can improve the accuracy of the search for highly cited documents.
- Factors such as publication date and identification of versions do not affect GS's ability to identify highly cited documents, because these factors have an incidental impact.

Therefore, GS can be considered an important search engine tool for highly cited documents, as this feature can reflect the general trend in academic works, which can be seen as an aspect of KUTD for staff and PhD students.

2.11.2.3 Mendeley and Citations

The literature reports some studies of reference management tools such as CiteULike, which is a social bookmarking tool, and Mendeley (Bar-Ilan et al., 2012), which focuses on publications and is used to share bibliographic references (Ortega, 2015a). Mendeley readership can be used to determine the patterns of dissemination of academic research (Mohammadi and Thelwall, 2014). There is a positive relationship between Mendeley

readership and citation counts for all sub-disciplines of engineering and technology, social sciences, physics and chemistry (Mohammadi et al., 2015). Many studies have investigated cross-disciplinary differences in the use of social bookmarking tools (Ortega, 2015a). Most of these were conducted on Mendeley, as social science users comprise the smallest group and computer sciences the largest (Oh and Jeng, 2011). Jiang et al (2013) reports that HASS had more followers in terms of numbers of users, while there were no great differences in motivation for using Mendeley across disciplines.

Overall, tracking citations can illuminate general trends in a particular topic or discipline and can provide users with the most relevant materials. Therefore, tracking citations can be used as a KUTD method to discover new information resources.

2.11.3 Alert Services

This section offers an overview of the literature on alert services. SDI services were once important providers of CA and content alerts for library users; as technology has advanced, they have become alert services, using email (Jetty and Paul Anbu K, 2013). Since then, libraries have adopted the approach of delivering access to information resources at any time and place, even while users are on the move (Paul Anbu K and Mavuso, 2012). Thus, library services are increasingly concerned with how to link users, technology and information in particular contexts. One aspect of this transformation is the provision of alert services, delivering important and time-sensitive content and references by email, at daily, weekly or monthly frequency determined by the user (Jetty and Paul Anbu K, 2013). By creating accounts with databases, journals or publishers, users can receive alerts of many different types, including TOC, search, citation alerts and RSS (Jabr, 2008).

Among the reasons for using alert services are finding the most recent information, keeping updated in particular subject areas and being aware of the latest ideas, opportunities or general trends in specific fields (Zandian et al., 2010). Alert services can save users time and effort in meeting their information needs, thus helping libraries to develop strong relationships with them (Zandian et al., 2010; Attfield and Blandford, 2011). Alert services can reportedly cause information overload (Wu and Chen 2012; Attfield and Blandford, 2011), which could be mitigated by the provision of a filter option (Jetty and Anbu, 2013). Further research is needed in this area, given the paucity of studies of the use of alert services by academics.

The behaviour of alert service users can be categorised as reviewing or following on, i.e. simply reading the materials received or taking subsequent action such as saving information sources for future use or adding it to one's personal collection to read later (Attfield and Blandford, 2011).

The ISB literature distinguishes between active and passive monitoring behaviours (Bates, 2002). Alert services represent a type of monitoring used to KUTD. Many studies have examined active ISB among professionals such as social scientists (Ellis, 1989; Meho and Tibbo, 2003), physicists and chemists (Ellis et al., 1993), engineers (Ellis and Haugan, 1997) or academic lawyers (Makri et al., 2008). Previous studies have also discussed methods of monitoring and KUTD such as attending conferences, using personal networks or receiving alerts of academic journal TOCs, but relatively few have focused on passive ISB and monitoring. For example, Fernandez (2002) investigated both active and passive monitoring among researchers who preferred to use PubMed, many of whom were biologists. Another study found a need for alert systems to provide relevant information to clinicians and considered the importance of context, including the task and the environment (Hinze et al., 2006). Farooq et al (2008) investigated awareness mechanisms in CiteSeer^x, an electronic library for computer and information science, finding that users preferred to use feeds that provided target items in query-relevant contexts, which varied among publication events. Researchers also used these feeds routinely to collaborate with their peers (Farooq et al., 2008). Both Hinze et al (2006) and Farooq et al (2007) show that appropriate research can elucidate service users' requirements, but existing studies do not provide a complete account of alert services and more research is required.

Another important strand of research into library alert services concerns the use of short message service (SMS) to deliver content alerts. For example, a review of mobile technology use to inform libraries includes SMS (Murray, 2010), while studies of library services by Paul Anbu and Mavuso (2012) in Swaziland and by Jetty and Paul Anbu K (2013) in India prove that SMS can be applied successfully to provide SDI services. Attfield and Blandford, (2011) investigated the requirements for users to interact with electronic CA and alert systems in academic environments and identified the risk of information overload by using alert services. They also found that misalignment between user concepts and the system can be a barrier to successful use.

In the academic context, Wu and Chen (2012) found that students, including PhD students, tend not to use alert services much, because they receive too much irrelevant information

(Catalano, 2013; Hsin et al., 2016). On the other hand, 36% of a total of 2,063 researchers at five US universities tended to use alert services (Niu et al., 2010). This shows that researchers can distinguish between relevant and irrelevant information and can create more accurate keywords or concepts when searching. In addition, Sections 2.8.2 and 2.9.2 of the present literature review, on PhD students' ISB and disciplines respectively, note that particular disciplines use alert services to search for academic journals and to KUTD in disciplines such as engineering, astronomy and physics (Sahu and Nath Singh, 2013; Jamali and Nicholas, 2010).

This section has provided an overview of literature on aspects of alert services including definitions, but relevant studies were found to be limited and to provide an incomplete picture of alert services, KUTD tools and how and why staff and PhD students use them.

2.12 The Library as Service Provider

Higher education has faced many challenges in recent decades, affecting the role of academic libraries. These challenges have many causes, including the move to an inter-disciplinary approach to learning and research (Raju et al., 2018). Meanwhile, lecturers and academics have abandoned the top-down delivery of education and now play the important role of facilitators of education as liberator (Schoombee and Raju, 2013). Technological advances have also facilitated information access beyond the confines of academic libraries (Cooke et al., 2011). These challenges have resulted in a lack of government support, increased competition among higher education institutions and limitations in information resources (Sputore et al., 2015).

An academic library is an institutional resource that serves the teaching and research needs of staff and students (Adeniran, 2011). The user is at the heart of its activities; therefore, the academic library must deliver the right information to the right user at the right time (Pedramnia et al., 2012). Academic libraries aim to provide relevant, effective and efficient information resources (Raju et al., 2018). In the electronic age, academic libraries have moved from print content to information sources in digital format (Raju et al., 2018). In the past, users needed to go to the library to search for information (the pull philosophy), whereas today's academic libraries have adopted the push philosophy, where the library goes to the user (Raju et al., 2018). This change has facilitated different services to deliver information sources to users irrespective of their location relative to the library. Therefore, the library

must ensure access to full-text sources via a range of devices such as mobile smartphones (Sennyey et al., 2009). Advances in technology have made it easy for individuals to interact directly with sources, rather than seeking a librarian's help, and have limited visits to libraries so that users no longer need to learn library research skills (Sadeh, 2007).

Each academic library should support research by providing a set of services and facilities that enhance research developments and productivity (Parker, 2012). These services include information and data collection, organization and dissemination (Borgman, 2010). An academic library's role has changed from delivering information support and training to offering support for researchers during the various stages of the research lifecycle (Brown et al., 2015).

With regard to training in general, there has been very limited discussion in the literature. Few libraries appear to have had an information literacy strategy and even fewer a strategy for providing information services to PhD students or to students in general, while there has been very limited evidence of systematic needs evaluation for researchers (Streatfield et al., 2010). It is important first to consider users' needs, then to provide the type of training they require. For example, training sessions for staff may be different from those for PhD students, but libraries need to teach the essential skills for searching and retrieving information sources (Ganaie and Khazer, 2014). Libraries should also focus on how to develop advanced searching skills and efficient searching strategies that incorporate diverse information searching tools including library websites (Korobili et al., 2011; Spezi, 2016). Furthermore, libraries should provide more specific services to different users, because they serve staff members and PhD students, each of whom will tend to focus on a very narrow topic. The ability to personalize the services or customize the library website is a very important feature that library services should ensure (Kim, 2011).

The previous section was envisaged as providing an overview of how academic libraries' roles have changed as a result of technological advances and changes in user behaviour and expectations, but there are very few studies in the literature exploring these changes in depth. However, the literature does discuss new academic library services such as e-research (Heidorn, 2011), bibliometric analysis (Corrall et al., 2013), research data (Tenopir et al., 2012a; Henderson and Knott, 2015; Kouper et al., 2017), data management (Peters and Dryden, 2011) and data repositories (Newton et al., 2010).

2.12.1 The Library, Staff and PhD Students

Many studies have investigated how libraries and librarians can meet the information needs of PhD students in general and in different disciplines (George et al., 2006; Fleming-May and Yuro, 2009; Gullbekk et al., 2013; Lee et al., 2014). Libraries need to recognize each PhD researcher's identity in order to determine their needs and respond to them (Petch et al., 2016). Academic libraries, which can significantly affect the success of PhD students (Spezi, 2016), should deliver many services to them throughout their research workflow, addressing current awareness, ethics, information and data management (Madden, 2014).

Several authors state that while PhD students are heavy users of online library services, they tend not visit the library in person (Vezzosi, 2009; Catalano, 2013; Bøyum and Aabø, 2015). Among the reasons for this is their lack of awareness and knowledge of the services and how to use them (Gibbs et al., 2012). PhD students are also unsure of librarians' working hours and what information they can ask them to provide (Sloan and McPhee, 2013). Some have been found to believe that librarians may lack the necessary specialist knowledge or experience, so they prefer to take a self-taught approach to learning library skills (Rempel, 2010). In addition, some PhD students are unaware of the service whereby libraries provide online access to various information sources and free subscriptions to e-journals and databases (Carpenter, 2012).

International students often face additional barriers to seeking help from librarians. Several studies have identified a number of factors affecting Chinese speakers studying in North America, for example:

- The language barrier of poor speaking skills in English, compared to their reading skills, and lack of confidence in seeking personal help;
- The cultural barrier of believing that asking for help would be perceived as a sign of weakness (Chen and Brown, 2012).
- The practical barrier of finding the library website less easy to use than the web and search engines (Wu and Chen, 2014).
- Uncertainty about librarians' roles and how they can help, leading international students to prefer to seek help from friends or colleagues (Liu and Winn, 2009).

Other studies have found that academic staff also made little use of the library. The causes identified at Kuwaiti university were lack of library staff, low quality of resources and limited

access to international information sources (Marouf and Anwar, 2010). A study in Pakistan found that staff complained of inadequate information resources and tended to prefer to use Google and Google Scholar (Khan and Shafique, 2011). Haines et al (2010) similarly found that staff at a US university tended not to use the library or its website, depending instead on search engines.

On the other hand, some studies have found significant library use among PhD students and staff. For example, 66% of PhD students at Boston University used the library and its website at least once a week (Library Assessment Conference, 2012), while 90% of staff and 44% of PhD students at Loughborough University used the library website once a week (Walton and Leahy, 2013).

Nevertheless, low library use is the general trend among staff and PhD students in most of the studies in the literature. Instead, staff seek help or recommendations about relevant information sources from colleagues and personal networks inside or outside the university (Connaway and Dickey, 2010; Haines et al., 2010), while PhD students ask staff for help and advice and receive feedback to shape their research (Drachen et al., 2011; Liyana and Noorhidawati, 2010). PhD students also consider the use of personal networks to be valuable throughout their research (Vezzosi, 2009). Among the factors affecting library use are:

- Convenience: It is important to provide library services in a way that saves time and matches users' needs, in order to encourage greater use.
- Attention: Each library must ensure the best quality of services to compete with external services and attract users' attention.
- Awareness: Users must be made aware of the services that the library provides and there must be an effective strategy to promote and facilitate academic library services (Cheong Choy, 2011).

With regard to seeking a librarian's help, a study at a Greek university found that just 11% of postgraduates did so at the beginning of their research and a total of 38% never sought such help (Korobili et al., 2011). Among the reasons identified for international students not seeking a librarian's help were the usefulness of search engines compared to the library website, lack of the skills needed to evaluate search outcomes and barriers of language and culture (Chen and Brown, 2012). Chinese students in particular perceived the librarian's help as a weakness in their culture. Furthermore, most students, even those with some training, experience discomfort when using library resources (Blummer et al., 2012), although the

literature does not discuss this point clearly. Meanwhile, librarians can be an important factor affecting PhD students' success. A study of first-year humanities PhD students found that information literacy should include KUTD, ethics and information management (Madden, 2014). However, it also emphasized the importance of flexibility in delivering services to PhD students at different research stages and levels of ability. Although PhD students report themselves as expert in internet searching and good at using library resources (Korobili et al., 2011), the literature indicates that students struggle to develop effective library search strategies (Spezi, 2016). Thus, it is important to make students aware of the range of services that libraries provide (Catalano, 2013) and to develop effective search strategies (Korobili et al., 2011).

Furthermore, academic staff have shown a lack of knowledge about library services and information sources in general (Palmer, 1991a; Mansour, 2017).

2.12.2. Academic Library Websites

With regard to using library websites, users generally expect the experience to be similar to using internet search engines, but find that it is more complex (Kress et al., 2011). Users have reported that design and usability were the most important factors affecting their decision on whether to use a library website (Kim, 2011).

The literature identifies many difficulties that staff, PhD students and others face in using academic libraries' websites, including availability of information resources and access to them (Ge, 2010; Chaurasia and Chaurasia, 2012; Ganaie and Rather, 2014).

Unclear terms and concepts in the library interface can cause confusion for users (Denton and Coysh, 2011; Majors, 2012). Terms which can be misunderstood include 'periodical', 'serial' and 'library catalogue', while indexing and subject classification can be confusing (Alazemi, 2015). Overall, only 49% of the content of academic library websites is jargon free, according to Singley (2014). Further difficulties that staff can encounter are insufficient time to search for information sources scattered under different categories and disorganized content dispersed across several webpages (Khan and Shafique, 2011; Ge, 2010), making it difficult to locate known items or materials (Kress et al., 2011). Furthermore, the literature reports that students struggle to conduct searches on library websites, especially when they try to develop effective searching strategies (Tomaszewski, 2012). Singley (2014) identifies the following issues facing users of academic library websites:

- Understanding how to search: Inexperienced users may write a type of information source in the search box, instead of searching under the relevant database page, for example.
- Need to authenticate: Users must provide a user name and password several times when moving from the library website to external pages, which can take time and effort.
- Finding full texts or materials: It can be difficult to find full-text PDF documents or to request books or other sources from another library.
- Understanding relationships: Some users fail to understand relationships between journals and articles (Singley, 2014).

Academic library websites should facilitate the provision of services in a similar way to search engines, which ensure ease of use (Connaway and Dickey, 2010; Johnson et al., 2016). Natural language searching can help users to make the right choices and identify the correct categories, such as “Finding a book” or “Find an article” (Kupersmith, 2012).

Overall, academic libraries need to improve users’ awareness of their services (Smith, 2011). They should understand users’ needs and monitor changes in their perceptions or behaviour (Kim, 2017). It is also important to understand users’ expectations in order to provide high quality services (Hossain Shoeb, 2011). In short, a systematic strategy to evaluate, maintain and improve services would ensure that academic libraries meet users’ needs and deliver better support and services, which in turn would improve users’ learning (Korobili et al., 2011; Khan and Bhatti, 2012; Delaney and Bates, 2018; Daland, 2013).

While the literature clearly emphasizes the need for academic libraries to work on understanding their users and on making them aware of the services that they provide, it does not discuss in detail the different services that libraries need to provide in the electronic environment, or how library services have changed over time. Discussion of services is rather general, whereas specific services such as KUTD are not often considered in the contemporary context; instead, there is more focus on KUTD in the past, as discussed in Section 2.3 (History of KUTD and Definitions).

2.13 Summary

This chapter has reviewed the literature on ISB and KUTD pertinent to the present research. It began by explaining how the literature was searched, then presented the history of KUTD and defined it in relation to other relevant concepts. There followed a discussion of the various models of ISB and a justification for choosing certain of these models to form the theoretical framework of the present research. After consideration of the ISB of staff and PhD students, there was an examination of all factors that might affect their KUTD behaviour and the different methods that could be used to keep staff and students updated. Finally, KUTD was discussed as a service provided by libraries. Overall, the literature review has identified different KUTD methods, examined their use in academia and raised questions about how academic libraries provide KUTD services. It has also considered which of the factors discussed in the literature can affect the usage of these methods and investigated obstacles to KUTD.

Chapter 3: Research Methodology

3.1 Introduction

From the outset, it is important for any researcher to choose the most appropriate methods for conducting a study and collecting the data. The main factors that determine the choice of research design and data collection methods are the aims, objectives and research questions (Arora, 2011).

This chapter explains the choice of methodology for the present research, dealing successively with research philosophy, approach, strategy and methods, then justifying these choices. In other words, it follows the structure of the research process as described by Saunders et al (2012) and illustrated in Figure 9.

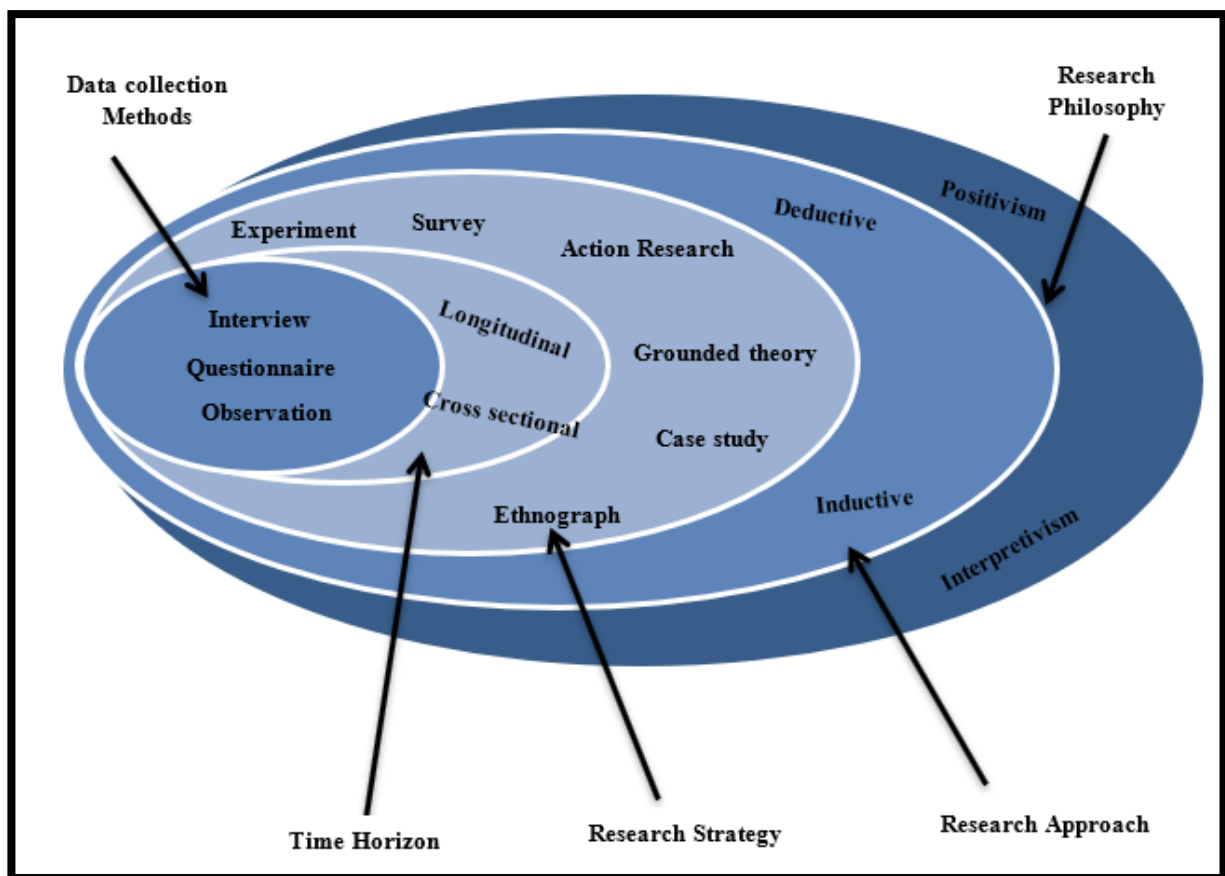


Figure 9: The Research Process (Saunders et al., 2012)

3.2 Research Philosophy

A research philosophy can be defined as a systematic way of understanding beliefs and assumptions about the general development and nature of knowledge (Saunders and Lewis, 2012). It can help the researcher to choose the most appropriate methods by providing a deep understanding of the advantages, disadvantages and limitations of each method, thus enhancing the quality of the research (Remenyi et al., 1998). In selecting a research philosophy, it is important to determine not only how it addresses the research questions, but also how the aforesaid understanding is created and how it reflects the researcher's position in relation to this philosophy.

The researcher should begin by asking what the research is, why it is being conducted and how it is to be done (Holden and Lynch, 2004). Answering these questions will provide a clear understanding of the methods that need to be chosen. It will involve considering the main elements of the research paradigm, namely ontology, epistemology and methodology. Ontology asks questions about the nature of reality, such as: 'Is it a single reality or not?' This leads to different constructions in every context (Pickard, 2013). Epistemology asks questions about how researchers get to know about the phenomenon under investigation (Pickard, 2013). To acquire true knowledge, researchers need to provide logical evidence for any claim. Epistemological assumptions concern the nature of knowledge and how to create, acquire and communicate it (Saunders and Lewis, 2012). This means understanding the relationship between what we already know and what we can know (Guba and Lincoln, 1994).

To discover new knowledge, then, assumptions need to be made about reality (ontology) and knowledge (epistemology) (Crotty, 1998). The following subsections discuss the ways in which truths about the world and knowledge are approached by three research paradigms: positivism, post-positivism and interpretivism.

3.2.1 Positivism

Positivist researchers adopt the research techniques of natural science to examine social phenomena (Saunders et al., 2012), collecting data about reality in order to search for cause-and-effect relationships (Neuman and Robson, 2007; Gill and Johnson, 2010). This depends on testing or creating theories and establishing laws about the phenomenon; therefore, it is an

objective approach (Saunders et al., 2012), where direct observations and physical interpretations are needed to understand reality and reach the truth. In other words, the purpose of positivism is to understand how things have happened, then predict what will come next (Pickard, 2013). Its main features are these:

- **The world** has physical and social aspects and does not exist only in the human mind.
- **Measurement:** Observations are required to take measurements and create models.
- **Quantitative methods:** A strong statistical analysis is usually applied.
- **Universal laws:** Research aims at generalization (Oates, 2005; Pickard, 2013).

3.2.2 Post-positivism

The post-positivist paradigm also suggests that reality exists independently of the human mind, but that it is difficult to determine (Robson, 2011; Saunders et al., 2012). According to Saunders et al (2012) and Tashakkori et al (1998), post-positivism is a more advanced version of positivism, comprising direct realism and critical realism. Direct realism asserts that our observations directly represent external reality, whereas critical realism considers observations and experiences to be sensations indirectly representing the real world (Saunders et al., 2012). Both qualitative and quantitative methods can be used for post-positivism, whose main aim is generalization (Denzin and Lincoln, 2011; Pickard, 2013).

The main features of post-positivism are:

- **The world:** Social objectives are independent and external to human beings and cause-and-effect relationships exist but are not easy to discover.
- **Measurement:** Discovery is subjective in its interpretation, so the researcher needs to explain and demonstrate it objectively.
- **Methods:** Both quantitative and qualitative research methods are used.
- **Universal laws:** Generalization is still under investigation. (Pickard, 2013).

3.2.3 Interpretivism

Interpretivism, often referred to as ‘relativism’, assumes that researchers and participants interact with the world as a result of understanding and interpreting it from within their own frames of reference (Orlikowski and Baroudi, 1991; Bryman, 2016). It also recognizes the subjective meanings that can play an important role in social interactions (Walliman, 2015).

This paradigm sees social life as dependent on individual beliefs and ideas rather than on objective reality; social reality is constructed and focused on understanding the meanings that individuals give to reality (Neuman and Robson, 2007; Pickard, 2013). The purpose of interpretive research is to investigate social actions and to determine their causes and effects (Bryman, 2016; Weber, 2009).

The main features of interpretivism are:

- **The world** has multiple realities and each individual perceives it differently.
- **Measurement:** studying people in their social context, accessed through understanding, communicating and sharing.
- **Methods:** usually qualitative, but quantitative ones can be used as well.
- **Multiple interpretations** are needed to provide a true account of phenomena (Oates, 2005; Pickard, 2013).

Further details of the philosophy adopted by the current research are given in (Section 3.7 Justification of Methodology), which also explains and justifies the choices made.

3.3 Research Approach

There are two types of research approach: deductive and inductive (Hayes, 2000; Bryman, 2016). The deductive approach uses empirical observations to develop the conceptual or theoretical structure of the research (Collis and Hussey, 2014). Conducting quantitative research deductively means clarifying the relationships between theory and research with evidence, rather than developing a theory and generalizing the results (Hayes, 2000; Gorman et al., 2005; Bryman, 2008), and confirmation comes from hypothesis-testing (Eriksson and Kovalainen, 2015). Deductive research relies predominantly on quantitative methods, although qualitative ones can also be applied (Saunders et al., 2012). Generalization is a characteristic of the deductive approach; therefore, one must carefully select a research sample large enough to allow for the generalization of the findings (Saunders et al., 2012).

In contrast, in the inductive approach, data is collected and analysed in order to develop a theory from the specific observation of reality (Saunders et al., 2012). Table 2 compares the deductive and inductive approaches.

	Deductive	Inductive
Logic	If the premises are true, the conclusion has to be true	Premises used to generate untested conclusion
Generalization	From general to specific	From specific to general
Use of data	Data collection used to evaluate the hypotheses of an existing theory	Data collection used to create conceptual framework
Theory	Theory verification	Theory creation and building

Table 2: Comparison between Deductive and Inductive Research (Saunders et al., 2012)

3.4 Mixed Methods of Data Collection

A methodology can be defined as a strategy or plan that explains the use and selection of certain methods (Crotty, 1998), which in turn are the techniques used to collect data (Bryman, 2016). A research design using mixed methods can combine their advantages, mitigate their limitations and allowing the findings to be enhanced, clarified and correlated (Saunders et al., 2012). A mixed-methods design can thus provide an in-depth understanding of a phenomenon and present much stronger evidence than a single method (Tashakkori and Teddlie, 2010; Bryman, 2016). Among its other advantages are flexibility and the capacity to deal with complex situations and to respond to different research questions and objectives (Saunders et al., 2012; Bryman, 2016). In addition, mixed-methods research can identify the similarities and differences between particular aspects of the phenomenon under investigation (Bernardi et al., 2007).

Disadvantages associated with the use of mixed-methods research include the expenditure of more time, effort and money, and the need for specific skills to collect and analyse the data (Whitehead and Schneider, 2007; Saunders et al., 2012).

3.4.1 Quantitative Research

Quantitative research tends to examine the relationships between variables represented numerically (Venkatesh et al., 2013), adopting a deductive approach to address questions such as ‘How much?’ and ‘How many?’ (Saunders et al., 2012).

Some advantages of quantitative methods are that they can be administered and evaluated quickly and that having the data in numerical form allows the researcher to draw comparisons between individuals, groups and organizations, which can reflect the extent of the agreement or disagreement between the responses (Yauch and Steudel, 2003). Among their

disadvantages are that their effectiveness depends on a large sample size, which may be difficult to obtain (Choy, 2014), and that individual beliefs, ideas, perceptions and identities cannot always be meaningfully conveyed without reference to the original context (Dudwick et al., 2006).

One quantitative method that can be cheaply, quickly and easily administered to a large population is the questionnaire (Pickard, 2013; Saunders et al., 2012). Online questionnaires can also be used to create databases, thus ensuring the accessibility of the data and the reliability of the analysis (David and Sutton, 2011).

3.4.2 Qualitative Research

Qualitative research provides in-depth information about a real-world phenomenon that reflects the complexities of human behaviour in different situations (Cooper et al., 2007), by asking ‘what’, ‘how’ and ‘why’ questions (Pickard, 2013). It usually adopts an inductive approach and uses non-probability sampling techniques (Saunders et al., 2012).

There are three types of qualitative data-collection methods (Mack et al., 2005):

- Observation provides data about natural behaviour in different contexts;
- In-depth interviews elicit data on individual perspectives; and
- Focus groups generate data about human reactions to different situations.

Some advantages of qualitative research are the ability to reflect individual beliefs, ideas, perceptions and identities, thus gaining a fuller understanding of the phenomenon (Yauch and Steudel, 2003), and the fact that open-ended questions allow participants to express their feelings and ideas and to raise issues that matter to them (Choy, 2014). On the other hand, qualitative research has the disadvantages of being time-consuming and tending to overlook important issues such the need for skilful an interviewer, the researcher is also limited in perceiving and interpreting issues that may arise and in drawing unbiased conclusions, which means that the results cannot be objectively verified (Choy, 2014). It is also common for researchers to misinterpret or limit the responses because they reflect their own personal experiences and knowledge, with the potential to bias the findings of the research (Yauch and Steudel, 2003).

Interviews provide rich and detailed data and emphasize generalization about the research ideas (Bryman, 2016). There is usually an interview guide that includes topics and questions which need to be discussed in a particular order (Robson, 2011).

The present research used an online questionnaire (as detailed in Chapter 5 and 6) and semi-structured interviews (as detailed in Chapter 7).

3.5 Methodologies used in Previous Studies

This section offers an overview of the research methods that have been used in ISB and in library and information studies (LIS). Table 3 lists the methods used in studies of ISB reported in the literature which have examined how staff and students of higher education institutions, including universities, search for information. The intention was to search for all studies that investigate ISB to check whether KUTD methods were mentioned and to provide an overview of the most frequently used research methods. The results are summarized in Table 3, which lists all relevant studies in higher education that focus on academic staff, postgraduate and undergraduate students in different faculties over various period of time.

Title of study	Authors and date	Methods
A study of factors that affect the information-seeking behaviour of academic scientists	(Niu and Hemminger, 2012)	Questionnaire
Correlates of undergraduates' information- seeking behaviour	(Tella, 2009)	Questionnaire
Factors affecting knowledge sharing intention among academic staff	(Jolaei et al., 2014)	Questionnaire
Faculty information behaviour in the electronic environment: Attitudes towards searching, publishing and libraries	(Borrego and Anglada, 2016)	Questionnaire
How does Internet information seeking help academic performance? – The moderating and mediating roles of academic self-efficacy	(Zhu et al., 2011)	Questionnaire
Information seeking and searching habits of Greek physicists and astronomers: a case study of undergraduates	(Brindesi et al., 2013)	Questionnaire
Information seeking behaviour of astronomy/astrophysics scientists	(Sahu and Nath Singh, 2013)	Questionnaire
Doctoral students' information behaviour: an exploratory study at the University of Parma (Italy)	(Vezzosi, 2009)	Semi-structured interviews
Information-seeking behaviour of academic meteorologists and the role of information specialists	(Hallmark, 2001)	Semi-structured interviews
Information-seeking behaviours of computer scientists: Challenges for electronic literature search tools	(Athukorala et al., 2013)	1-Mixed-method case studies involving interviews, diary logs, and observations. 2- Questionnaire

Title of study	Authors and date	Methods
Information-seeking behaviour of undergraduate biology students: A comparative analysis of first year and final year students in University College Dublin	(Callinan, 2005)	Questionnaire
Interdisciplinarity and the information-seeking behaviour of scientists	(Jamali and Nicholas, 2010)	Questionnaire
International students' everyday life information seeking: The informational value of social networking sites	(Sin and Kim, 2013)	Questionnaire
Keeping up to date: An academic researcher's information journey	(Pontis et al., 2015)	Semi-structured interviews and prototype testing
Modelling information-seeking behaviour of graduate students at Kuwait University	(Al-Muomen et al., 2012)	Questionnaire and semi-structured interviews
Information needs and seeking behaviour of science & technology teachers of the University of the Punjab, Lahore	(Tahira and Ameen, 2016)	Questionnaire
Patterns of graduate students' information seeking behaviour: a meta-synthesis of the literature	(Catalano, 2013)	Systematic search of databases for studies on information behaviour and graduate students
Reading habits and attitude in the digital age: Analysis of gender and academic program differences in Malaysia	(Shahriza Abdul Karim and Hasan, 2007)	Questionnaire
Reasons for the use and non-use of electronic journals and databases: A domain analytic study in four scholarly disciplines	(Talja and Maula, 2003)	Interviews
Scholarly communication trends in the digital age: Informal scholarly publishing and dissemination, a grounded theory approach	(Shehata et al., 2015a)	Semi-structured interviews
Scholarly journal use and reading behaviour of social scientists in Taiwan	(Wang, 2010)	Questionnaire and interviews
Scholarly article seeking, reading, and use: a continuing evolution from print to electronic in the sciences and social sciences	(Tenopir et al., 2015)	Questionnaire
The impact of information and communication technologies on informal scientific communication: A naturalistic inquiry approach	(Shehata et al., 2015b)	Semi-structured interviews
The information practices of business PhD students	(Bøyum and Aabø, 2015)	Semi-structured interviews
Trustworthiness and authority of scholarly information in a digital age: Results of an international questionnaire	(Tenopir et al., 2016)	Questionnaire
Undergraduates' academic reading format preferences and behaviours	(Mizrachi, 2015)	Questionnaire
Use of electronic information resources and facilities by humanities scholars	(Tahir et al., 2010)	Questionnaire
When is "enough" enough? Modelling the information-seeking and stopping behaviour of senior arts administrators	(Zach, 2005)	A multiple-case studies design using interviews
Information-seeking behaviour of business and economics faculty: A case study	(Gil, 2016)	Questionnaire
Information-seeking behaviour of the social sciences faculty at Kuwait University	(Marouf and Anwar, 2010)	Questionnaire
Patterns of information seeking behaviour of law students in a digital environment: A study	(Das and Jadab), 2017	Questionnaire

Title of study	Authors and date	Methods
use of library services by engineering faculty at Mississippi State University, a large land-grant institution	(Zhang, 2015)	Questionnaire
Disciplinary difference in students' use of technology, experience in using eLearning strategies and perceptions towards eLearning	(Lam et al., 2014)	Questionnaire
An exploration into the information-seeking behaviours of engineers and scientists	(Wellings and Casselden, 2017)	Questionnaire and interviews
Information-seeking behaviour of economics graduate students: If you buy it, will they come?	(Solis, 2018)	Questionnaire and focus group
Where and how early career researchers find scholarly information	(Nicholas et al., 2017)	Semi-structured interviews
Science vs. social science: A study of information-seeking behaviour and user perceptions of academic researchers	(Sheeja, 2010)	Questionnaire
Scholarly information seeking of academic engineers and technologists	(Arshad and Ameen, 2018)	Questionnaire
What do human factors and ergonomics professionals value in research publications? Re-examining the research-practice gap	(Chung et al., 2014)	Questionnaire
Who reads research articles? An Altmetric analysis of Mendeley user categories	(Mohammadi et al., 2015)	Quantitative analysis of different statuses for research articles in several disciplines in Mendeley
Gender difference in information seeking of research scholars at University of Sargodha, Pakistan	(Khan and Nisa, 2017)	Questionnaire
Information seeking behaviour of mathematicians: scientists and students	(Sapa et al., 2014)	Questionnaire
Information technology and the humanities scholar: Documenting digital research practices	(Given and Willson, 2017)	In-depth qualitative interviews during a real-time session
Is information-seeking behaviour of doctoral students changing? A review of the literature (2010–2015)	Spezi, 2016	Review of the literature
Modes of information seeking: Developing personas of humanities scholars	(Al Shboul and Abrizah, 2016)	Interviews using personas method of analysis
Assessing information seeking behaviour of computer sciences and engineering faculty	(Tucci, 2011)	Focus Group
The information-seeking habits of engineering faculty	(Engel et al., 2011)	Questionnaire
Factors that influence information-seeking behaviour: The case of Greek graduate students	(Korobili et al., 2011)	Questionnaire

Title of study	Authors and date	Methods
Human information behaviour: Integrating diverse approaches and information use	(Spink and Cole, 2006)	Conceptualizing human information seeking including everyday life information seeking: sense-making approach, information foraging approach, and problem solution perspective
How graduate students perceive, use, and manage electronic resources	(Wu and Chen, 2012)	Interviews
Changes in the digital scholarly environment and issues of trust: An exploratory, qualitative analysis	(Watkinson et al., 2016)	Interviews and focus groups
A Comparison of information seeking using search engines and social networks	(Morris et al., 2010)	Experiment in searching on search engines and social media
National study of information seeking behaviour of academic researchers in the United States	(Niu et al., 2010)	Questionnaire
Academic identity reconstruction: the transition of engineering academics to engineering education researchers	(Gardner and Willey, 2018)	Identity-trajectory framework
Modes of information seeking: Developing personas of humanities scholars	(Al Shboul and Abrizah, 2016)	Personas method of analysis
Information needs, perceptions and quests of law faculty in the digital era	(Ashokbhai Bhatt, 2014)	Questionnaire
Information seeking behaviour of scientists in the electronic information age: Astronomers, chemists, mathematicians, and physicists	(Brown, 1999b)	Questionnaire
Information-seeking behaviour in the digital age: A multidisciplinary study of academic researchers	(Ge, 2010)	Interviews
Information-seeking behaviour of social science scholars in developing countries: A proposed model	(Al-Suqri, 2011)	Interview
Information-seeking behaviours of business faculty	(Hoppenfeld and Smith, 2014)	Questionnaire
Information-seeking behaviour of physicists and astronomers	(Jamali and Nicholas, 2008)	Questionnaire
Information-seeking habits of education faculty	(Rupp-Serrano and Robbins, 2013)	Questionnaire
Modelling the information-seeking behaviour of social scientists: Ellis's study revisited	(Meho and Tibbo, 2003)	Interviews
Modelling the information seeking patterns of engineers and research scientists in an industrial environment	(Ellis and haugan, 1997)	Questionnaire
A tale of two departments: A comparison of faculty information-seeking practices	(Mayfield and Thomas, 2005)	Questionnaire
A study of information needs and seeking behaviour of faculty members of Darul Ihsan University in Bangladesh	(Mostofa, 2013)	Questionnaire

Title of study	Authors and date	Methods
An investigation of factors affecting how engineers and scientists seek information	(Anderson et al., 2001)	Questionnaire
Disciplinary differences and undergraduates' information-seeking behaviour	(Whitmire, 2002b)	Questionnaire
Understanding academic reading in the context of information-seeking	(Lopatovska and Sessions, 2016)	Questionnaire
Searching and sourcing online academic literature: Comparisons of doctoral students and junior faculty in education	(Hsin et al., 2016)	Interviews
The effect of the internet on researcher motivations, behaviour and attitudes	(Mulligan and Mabe, 2011)	Questionnaire and interviews
The relationship between students' subject preferences and their information behaviour	(Madden et al., 2018)	Questionnaire and interviews
The role of individual differences in internet searching: An empirical study	(Ford et al., 2001)	Questionnaire
Being where our faculty are: Emerging technology use and faculty information-seeking workflows	(Bauder and Emanuel, 2012)	Questionnaire
Information behaviour of humanities PhDs on an information literacy course	(Madden, 2014)	Questionnaire and interviews
Understanding the "complexity of experience": Modelling faculty research practices	(Falciani-White, 2016)	Interviews
Undergraduate' academic reading format preferences and behaviours	(Mizrachi, 2015)	Questionnaire
Understanding "influence:" An exploratory study of academics' processes of knowledge construction through iterative and interactive information seeking	(Pontis and Blandford, 2015)	Interviews

Table 3: Methodologies used in Previous Studies

Table 3 shows that a variety of methodologies have been used to extend our understanding of human ISB. Many studies of ISB have used both quantitative and qualitative methods including interviews, focus groups, diary logs, observation and questionnaires, this last being the most commonly adopted method (Gauchi Risso, 2016), while the main methods used in LIS information behaviour research between 1999 and 2008 were questionnaires and interviews (Julien et al., 2011). Hider and Pymm (2008) report that questionnaires were used more than any other method in library and information sciences, despite an earlier suggestion of the need to increase the use of experimental research in order to present the bigger picture of the phenomenon by considering its social and cultural characteristics (Huanwen, 1996).

The mixed-methods approach has been used for decades in the social and behavioural sciences (Fidel, 2008) and can be useful for studying information activities in different contexts (Habermas, 2015). The use of mixed methods can raise the quality of LIS research (Fidel, 2008) and meet the need for a scientific approach which quantitative data alone cannot provide (Chu, 2015).

3.6 Research Strategy: (Case Study)

Selecting the most suitable research methods with which to provide answers to the research questions is the keystone of any research (Mason, 2017). Punch (2013) describes research strategy as “a set of ideas by which the study intends to proceed in order to answer research questions”, while Saunders et al (2012) define it as “a plan of various actions pursued in order to achieve research goals”.

For each type of research, quantitative or qualitative, there are a variety of research strategies; for example, qualitative research can adopt action research, case studies, grounded theory, narrative research and ethnography as strategies (Pickard, 2013; Saunders et al., 2012), whereas quantitative research tends to follow a case study or mixed methods strategy (Saunders et al., 2012).

A case study is a thorough investigation of a phenomenon in the conditions of its real existence (Yin, 2017). It tends to use mixed methods to provide a detailed examination and understanding of one or more specific situations (Bansal and Corley, 2011; Lazar et al., 2017). Case studies have seven essential components (Lazar et al., 2017; Pickard, 2013):

- An in-depth investigation of a current event;
- An examination of the context.
- The use of multiple data sources and methods;
- The adoption of qualitative data analysis;
- A focus on ‘how’ and ‘why’ questions;
- An investigation of several entities, such as people, groups or organizations; and
- A holistic focus on units, relationships and their complexities.

A case study can be used for exploratory, descriptive or explanatory research purposes (Yin, 2017). It can take the form of a single, multiple, holistic or embedded study and can be positivist or interpretivist, deductive or inductive (Saunders et al., 2012). An inductive case study, for example, aims to identify specific entities or attributes (Ridder et al., 2014), enabling the researcher to build a theory and develop a set of hypotheses (Saunders et al., 2012).

A single case study focuses on a critical case that has been selected in advance in order to investigate and analyse a particular phenomenon (Pickard, 2013; Saunders et al., 2012), whereas multiple case studies allow the findings to be replicated across other cases and can

provide a better understanding by reflecting different perspectives (Lewis, 2015). Lazar et al (2017) assert that the use of multiple cases can ensure the credibility and reliability of the analysis and the findings.

The holistic/embedded distinction concerns the unit of analysis (Saunders et al., 2012). The holistic strategy takes a particular organization as a whole (Yin, 2017), while the embedded strategy focuses on investigating sub-units within the same organization, such as different departments or groups of participants (Saunders et al., 2012).

One of the limitations of the case study is that generalizing the findings will depend on the extent to which the case(s) is/are similar to others of the same type (Denscombe, 2014). Flyvbjerg (2007) warns that the literature contains misunderstandings about the ability of case studies to produce reliable findings which can be generalized and which contribute to knowledge. However, according to Bell (2014), the reliability of case studies is more important than their generalizability and Bassey (1999) notes that while not supportive of statistical generalization, a single case study may allow ‘fuzzy’ generalization to similar contexts or situations. The generalizability of the present findings is discussed in the discussion chapter. Table 4 summarizes the rationale for deciding to conduct a case study.

Advantages of the present study	<p>In this research, the case study:</p> <ul style="list-style-type: none"> • Delineates KUTD in a specific academic context. • Provides a subjective view of KUTD & describes individual engagement with it. • Provides answers to questions integral to case studies and this research: <ul style="list-style-type: none"> ➢ How do staff and PhD students remain current? ➢ Why do staff and PhD students follow certain KUTD practices? ➢ How can KUTD best be utilized? • Generates its own variables, reflecting reality accurately. • Generates findings which can be generalized to similar environments.
Research approach	<p>A case study demands a mixed-methods approach:</p> <ul style="list-style-type: none"> • Quantitative data from a questionnaire • Qualitative data from interviews
Research design	<p>This study takes an inductive approach, which means that research is:</p> <ul style="list-style-type: none"> • Data-driven, therefore less restricted by pre-research assumptions or questions. • Explanatory and descriptive. • Emergent; theory is derived from the research
Units of analysis	<p>The unit of analysis in a case study can come from among:</p> <ul style="list-style-type: none"> • Individuals, events, organizations, teams or departments. <p>In this study the units of analysis are:</p> <ul style="list-style-type: none"> • Strathclyde University and the University library
Data collection	<p>The researcher must:</p> <ul style="list-style-type: none"> • Fully understand the research and research question. • Define data as they are collected • Identify the researcher's influence on the research. • Remain unbiased.
Research purpose	<p>The researcher aims to:</p> <ul style="list-style-type: none"> • Carry out explanatory and descriptive research into KUTD • Gain a detailed, accurate overview of a well-defined subject.

Table 4: Rationale behind Choosing Case Study

3.7 Justification of Methodology

This section seeks to justify the methodological decisions taken in the present research, beginning with the choice of research philosophy, then turning to the research approach, methods and strategy.

The adoption of a post-positivist philosophy allows the study to explain how the reality of KUTD exists in the human mind. This entails the need to discover and interpret the individual's (subjective) opinions, in order to better understand cause-and-effect relationships that can be difficult to discover. The aims are to develop an understanding of individual perspectives and to formulate inductively a theoretical framework representing KUTD that can be applied to similar situations. Therefore, an explanatory and descriptive research design

was adopted in order to discover new ideas, conditions, attitudes, beliefs and social behaviour and to provide a detailed description of KUTD.

The research approach adopted is inductive, a choice justified by the process of moving from individual behaviour to more general behaviour in KUTD. There were two reasons for this choice. Firstly, an extensive literature review reveals very little research into KUTD. Some elements have been researched, but limited information is available on the phenomenon itself; the present research can thus be considered novel and original. Secondly, there is little or no empirical evidence of how staff and PhD students use KUTD methods and tools to remain informed, or of the types of behaviours that can represent KUTD. Therefore, it is important to understand this phenomenon by first identifying its main features, then recognizing the most influential factors and establishing the background to the phenomenon in the context of Strathclyde University. In addition, this research investigates the use of different methods and tools, then develops a framework to be used in academia, thus moving bottom-up, from a specific description of individual behaviour patterns to the more general behaviour of larger populations (Palys, 2003). In order to create such a framework for KUTD within academia and to develop an explanatory theory of KUTD usage, it is appropriate to take the inductive approach, because it is explanatory and descriptive in nature.

With regard to research methods, seeking to understand any phenomenon entails describing it as it really is, which in this case means reflecting the reality of KUTD. Thus, analysing the university library was the first step in gaining an understanding of this reality. By analysing its website, the researcher could understand how the library provided KUTD services and how users could interact with them. To deepen the researcher understanding of the reality of KUTD in the university, the researcher conducted an interview with the Subject Librarian of Sciences, who also acted as a representative of other subject librarians.

In order to understand KUTD as a phenomenon, it is important to consider its context; this enables me to understand more about people's perceptions and opinions. One example is to better understand how staff and PhD students KUTD in the academic environment of the university and how their KUTD practices reflect their different information needs and patterns of information seeking. These practices were identified by administering a questionnaire and conducting interviews with staff and PhD students. The questionnaire was used to identify the various KUTD methods used, to ascertain their frequency of use and to explore the factors affecting users' preferences among them. General information about KUTD elicited by the questionnaire provided additional substantial insights into the most

important issues to be investigated in greater depth by means of the interviews, including the different social, cultural and individual factors and motivations behind KUTD behaviour.

Exploring KUTD in context furnishes a deeper understanding of the effects of people's perceptions and opinions on their behaviour. This can be applied to understanding what makes KUTD in this environment different or special compared to other similar contexts.

Implementing the mixed-methods approach provided a good opportunity to gather different types of data from different sources, ensuring the wider coverage that would enable the whole picture of KUTD to be presented and reflect more accurately how the reality affected individual behaviour. The use of both quantitative and qualitative methods enabled me to collect statistical data casting light on the causal relationships between variables and to overcome any limitations or weaknesses associated with using any single method. As mentioned in (Section 3.5 Methodologies used in Previous Studies), the survey of published studies in the field indicated that mixed methods would best provide a detailed picture of KUTD practice.

The mixed-methods strategy used in the present research was structured in three successive stages, beginning with an investigation of the Strathclyde University library website and an interview with the science librarian. This was followed by the administration of the questionnaire and interviews, which addressed the following research questions:

- What methods are most frequently used to KUTD?
- Is there any association between age, gender, experience, faculty or position and differences in using KUTD methods?
- What are staff and PhD students' perceptions of KUTD in terms of its importance and difficulties?
- What is the role of the library in providing KUTD services?

Finally, a series of semi-structured interviews with some staff members and PhD students were conducted to provide more in-depth information related to the questionnaire findings; in other words, the interviews were complementary to the questionnaire, aiming to answer the following research questions:

- How important is it for staff and PhD students to KUTD?
- Why do staff and PhD students use or not use a particular method?
- How can the university help staff and PhD students to KUTD?

- How can the library help staff and PhD students to KUTD?

3.7.1 Studying a Single Case in the Present Research

To understand how Strathclyde staff and PhD students KUTD, it is important to know what is happening and why, by investigating the case of their behaviours and practices in the library. The case study strategy is particularly appropriate because it provides an empirical description of the phenomenon and an understanding of its interaction with the context, allowing the development of a theory (Dubois and Gadde, 2014; Ridder et al., 2014). This research is initially explanatory, aiming to identify the conditions, attitudes, beliefs and social behaviour surrounding the phenomenon (Neuman and Robson, 2007), by describing KUTD practices as they occur in reality, without introducing a control on variables, because KUTD is a contemporary phenomenon over which the researcher have no control (Kothari, 2004). Since no initial hypothesis existed, an inductive approach was necessary to explore the phenomenon within its real-life context, where there is no clear boundary between phenomenon and context (Yin, 1994).

More specifically, this is a single case study of Strathclyde University whose sub-units are departments, staff members, PhD students and the library. A multiple case study of the KUTD phenomenon may be useful in future to elucidate the different relationships between factors and organizations, and to facilitate the design of better tools, but this is beyond the scope of the present time-limited PhD study, which is novel in investigating the nature of KUTD in depth for the first time, as there is little in the literature about the phenomenon itself. Instead, a single case study is the best strategy to identify the main characteristics of KUTD, to determine the most important influential factors and to establish the background to the phenomenon in the context of Strathclyde University.

Establishing a deep understanding of KUTD depends on investigating elements of this context including users' academic backgrounds, information needs, searching behaviours and levels of IT familiarity. Therefore, the idea was initially to conduct an investigation of KUTD to determine how long data collection would take. As a student at Strathclyde University, my access to people and my opportunity to talk to them was easier there than at other universities. Supervisor support helped to shorten certain procedures, facilitate meetings with staff and provide the help that the researcher needed to post my questionnaire advert with the University's Research and Development Programme.

In order to gather broader evidence of whether cultural or social factors can affect KUTD behaviour, mixed methods were used in the case study. This facilitated the exploration of individual perceptions of KUTD within Strathclyde University and any differences among staff and PhD students stemming from these cultural or social factors.

In detail, the case study involved investigating KUTD behaviour and methods by examining individuals' engagement with the University library, institutional support and training courses. This made it possible to compare the data on methods, behaviour, library and institutional support gathered in the present research with the equivalent findings of previous studies detailed in the literature review.

As already noted, context is of fundamental importance in a case study, the context of the present research being Strathclyde University. More particularly, it investigates the different KUTD behaviours to be found in the context of the University library and the institutional support provided. Analysis of the University library website and the interview with a librarian were used to explore this institutional and library support, as discussed in detail in the next chapter.

3.8 Research Techniques

The current research depends mainly on two fundamental techniques that have been used to investigate the KUTD services and methods that have been used. The first is the Information Technology Infrastructure Library (ITIL) framework, which has been used as a basis for evaluating the services that the library should provide, while the second is a questionnaire-based survey of the various types of behaviours that can be used, to enumerate and classify the different KUTD methods.

3.8.1 ITIL Framework

In order to analyse the university library website and evaluate the efficiency and effectiveness of the KUTD services it provided, the researcher used the ITIL framework, which considers ways of delivering high quality IT services matched with users' needs (Ahmad and Shamsudin, 2013). As Figure 10 shows, the framework addresses four main categories of service: strategy, design, transition and operation (Suhairi and Gaol, 2013). The following subsections provide details of each category that was used in the evaluation of the

Andersonian Library website, to be discussed in more detail in (Section 4.3 ITIL and the Library Website).

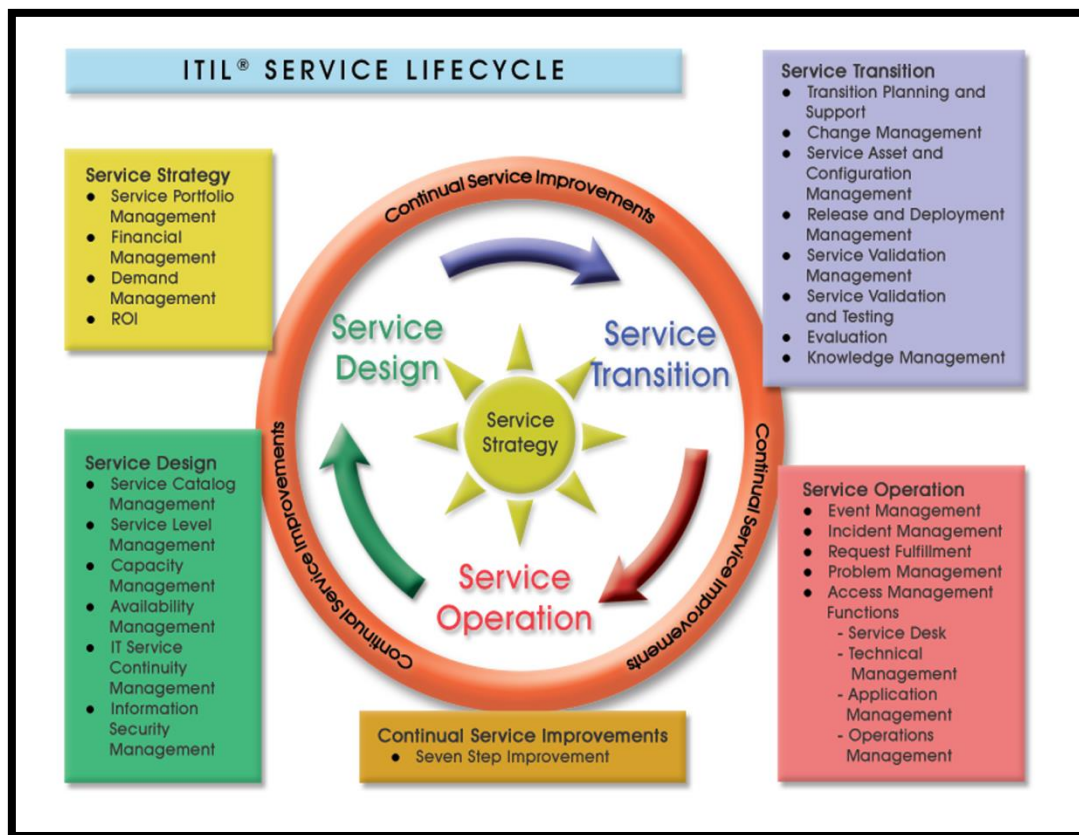


Figure 10: ITIL Framework (Suhairi and Gaol, 2013)

Service Strategy

The service strategy component consists of four elements, namely service portfolio management, financial management, demand management and return on investment (Suhairi and Gaol, 2013). Under service strategy, guides are provided for certain aspects such as design, development and the implementation of library services by the organisation; thus, ITIL offers guidance on the key principles of service management practices (Sharifi et al., 2008). Furthermore, it considers the basic processes by which the service operates, service assets, different types of services, and internal and external aspects of the service characteristics (Suhairi and Gaol, 2013).

Service Design

Suhairi and Gaol (2013) explain that fundamental to providing a service is for the design to match the institution’s business goals and users’ needs. Therefore, the service design component should recommend best practice to be considered in designing and building the

service. The design consists of different methods and principles which enable strategic aims to be converted into records of service assets. Service design includes many processes, such as service catalogue management, service level management, management capacity, availability management and IT service continuity management (Sharifi et al., 2008).

Service Transition

Sharifi et al. (2008) found that service transition guides the development of IT organisations by helping them alter the design of new and existing IT services, such as when a change occurs in the specifications of the operational environment. Service transition consists of processes such as change management, release and deployment management, knowledge management, asset service and configuration management (Cervone, 2008).

Service Operation

The focus of service operation is to ensure efficiency and effectiveness in delivering and supporting the service by guaranteeing value for both users and service providers. Its component processes include event management, incident management, problem management and the service desk (Sharifi et al., 2008; Cervone, 2008).

3.8.2 Questionnaire Based Research

A questionnaire survey was used in this research because it can provide a large quantitative dataset, making it possible to generalize the research findings and examine the similarities and differences between different groups of users (Rowley, 2012). Questionnaires can be used in either descriptive, exploratory or explanatory research, depending on what the researcher is investigating (Saunders et al., 2012). The quantitative part of the present research is descriptive, in that it identifies and describes different attitudes, opinions and behaviours in order to understand particular phenomena relating to KUTD in academia.

In order to construct a list of questions that will allow for data to be collected, the researcher must first set realistic parameters by establishing the aims and objectives of the research (Ellis, 2014). Since the present research objectives are mainly concerned with identifying the overall patterns of KUTD among staff and PhD students, a questionnaire was considered the most appropriate way of collecting data on their characteristics, behaviours, methods and practices. Questionnaires provide a proven way of investigating how staff and PhD students seek and use information and as such have been used in many studies in the areas of

information seeking and library and information science (Sapa et al., 2014; Sahu and Nath Singh, 2013, Jamali and Nicholas, 2010; Sapa et al., 2014; Engel et al., 2011; Vezzosi, 2009; Brown, 1999b).

Figure 11 shows that questionnaires can be broadly categorised as either self-completed or interviewer-completed, then further divided into several types. The present research employed an internet-based, self-completed online questionnaire, with the advantages for the researcher of low cost, ease of use and time saving, particularly when the data are processed and analysed via statistical software (Van Selm and Jankowski, 2006). As to the participants, their comfort and convenience are ensured because they can take their time without feeling any pressure. It also allows them to maintain their anonymity, which may encourage them to provide truthful answers (Ilieva et al., 2002).

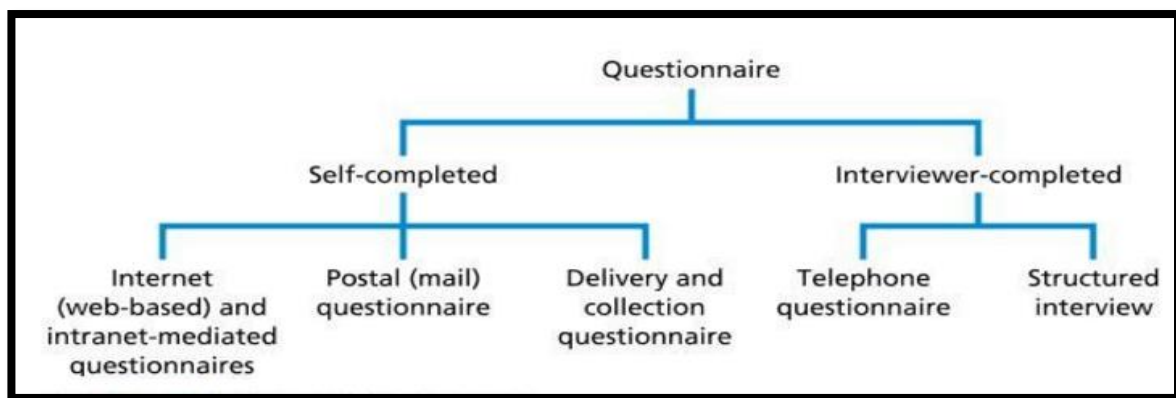


Figure 11: Types of Questionnaire (Saunders et al., 2012)

There are many advantages of using questionnaires in general. For instance, they can be easily distributed and accessed at the convenience of the respondents, which is particularly important because the present research population is busy and scattered across several schools. Van Gelder, Bretveld and Roeleveld (2010) claim that completing all questions in an online questionnaire is estimated to take about half the time needed to answer the same number of questions in a telephone interview. However, there are also some limitations and disadvantages of using self-completed questionnaires. Participants must be mostly self-motivated to invest the time and effort to complete them alone at a time and place of their choosing (Wright, 2005; Barbeite and Weiss, 2004). Consequently, they can have low response rates, especially when administered by email (Bryman, 2016; Bell, 2004). Response rates are discussed in detail in (Section 5.10 Questionnaire Response Rate).

Open- and Closed-ended Questions

The decision to use a questionnaire means that the researcher is interested in collecting information about a certain population in a systematic manner (Best, 2014), by asking all participants a number of questions in the same order with the same wording. The questionnaire items can be classified as open ended and closed ended. Open-ended questions allow participants to provide answers in their own way, in contrast closed-ended ones, which have a finite number of answers from which participants can choose (Saunders et al., 2012). Using open- or closed-ended questions has advantages and disadvantages that the researcher needs to consider. According to Denscombe (2014), answers to open-ended questions are generally longer, require more effort and are more difficult to analyse, since the participant has the freedom to decide the length and content of the answer. Consequently, such data tend to be richer and more complex and can include points that the researcher had not previously considered (Gray, 2006). In comparison, the answers to closed-ended questions fit into categories established by the researcher in advance, with responses being chosen from a range of options, which can be simple or more complex lists. Such questions have the advantage of providing pre-coded data, which can be easily analysed, although they do not always reflect exact facts or feelings on the topic of the research (Denscombe, 2014).

In the present research, most of the questions were closed ended and straightforward, in order to include all possible answers for participants. Closed-ended questions provide an easy and quick way to answer questions (Creswell and Creswell, 2017), enabling the researcher to easily analyse the data. At the same time, some open-ended questions were included to give participants the opportunity to express their thoughts and expand the given list of options. The answers to such questions helped the researcher to identify any missing options and provided a deeper understanding of KUTD behaviour from the respondents' perspective.

Questionnaire Structure

A well-structured questionnaire is very important in order to make the questions clear, easy and interesting to the participants. First, to ensure that the questionnaire would elicit the required data, the researcher had to decide what questions to ask (Gray, 2006), then each question had to be worded as objectively as possible, to reflect the intention of capturing the perceptions, interests and values of KUTD behaviour of staff and PhD students.

The questionnaire was structured around the need to collect four different types of data, on demographic characteristics, on KUTD behaviour, on participants' knowledge and on their

attitudes. Demographic information was gathered in order to be able to compare results for different groups or sub-groups. Data on observable KUTD behaviour, experience, actions and activities was collected in order to better understand KUTD in action. Information was also required about participants' knowledge to establish what they knew about KUTD services. Asking questions about their attitudes and opinions provided data that could be evaluated and analysed in an attempt to determine how staff and PhD students felt about different KUTD issues. However, it was expected that not all participants would show the same depth of feeling about KUTD, with some writing more and expressing stronger opinions than others.

As discussed above, both open- and closed-ended questions were used. Most of the open-ended items were complementary to closed-ended ones, such as first asking staff and PhD students to choose ways to KUTD from a list of possible methods, then inviting them to write about what they thought of these methods. These open-ended questions were limited in number, because it was assumed that the research population, particularly staff members, would not have much available time. As to the closed-ended items, the different types included the selection of items from lists, a list of categories where one option had to be chosen, and the ranking of items in order of preference or usefulness (Saunders et al., 2012).

Questionnaire design and technique used

The 26 items of the questionnaire were arranged in three sections Appendix 5. Section one, on demographic characteristics, comprised six closed-ended questions on the age, gender, country of origin and academic position of participants, as well as the school they belonged to and how long they had studied or worked at the university. The second section included items on participants' perceptions of the importance of KUTD, their ability, the difficulties they had encountered and the various methods that could be used. Full details of the questionnaire design and of the individual items are given in the questionnaire chapter. However, this section discusses in some detail one item, namely Question 13, concerning the KUTD methods that staff and PhD students may have used, but before detailing these methods it is important to understand how they were selected and classified. It is appropriate to discuss this item here because it depends on a particular technique to identify all potential behaviours that can be followed to KUTD. Examining these behaviours can then help to identify the different methods used to support particular behaviours, in accordance with the models discussed in the literature chapter.

Thus, multiple KUTD approaches, behaviours and models were identified by reviewing the literature. The present research follows the Ellis model in identifying searching, browsing, monitoring and chaining as the four main KUTD behaviours or activities Figure 3, then listing all possible methods under each activity, as shown in Table 5. It also adopts two aspects of the Bates model, recognizing the active and passive approaches and the online and offline modes. When drawing up this comprehensive list of methods, the researcher sought to cover both approaches and both modes.

At the final stage, the methods were grouped under names that reflected their shared characteristics. For example, the people and events (PE) group was constructed to include a number of behaviours, approaches and modes. A total of 26 individual methods or tools were thus classified into 9 main groups, to ensure full coverage of all possible methods available for users to KUTD. These are listed in the methods table in Q13 Appendix 5. After creating this table it was necessary to focus on the content of Question 13, as described in the following section.

Activity	KUTD methods
Searching	Use search engine websites (such as Google, Google Scholar, Yahoo and Bing)
	Use academic databases or bibliographies (such as Science Direct, Web of Science and EBSCO)
	Use academic sharing websites (such as Research Gate or Academia)
	Use academic journals (by accessing or subscribing to a journal)
	Post questions on social networks (such as Facebook or Twitter)
	Use professional associations (such as communication through newsletters and websites)
	Attend different events (such as conferences, seminars and workshops)
	Ask my colleagues
	Ask the library staff
	Visit the library or its website
Monitoring	Use alert services and feeds for academic journals or database websites
	Follow the latest research conducted by research groups
	Follow the latest research conducted by significant independent researchers in my field
	Use social media websites to follow certain academics or authors
	Set up alert services to notify me of new papers
Browsing	Scan the online table of contents of journals in my field
	Scan lists of papers in conferences
	Scan Amazon for new books
	Scan the library shelves
Chaining	Use 'cited by' in Google Scholar to see who has cited papers
	Follow references cited in an interesting paper
	Follow authors who cited interesting papers
	Use specialized applications to import all cited papers (such as Clowiz, RefWorks and Mendeley)

Table 5: KUTD Methods in the Second Stage

Question 13 elicited detailed information on participants' KUTD behaviour by asking them to select from a list of methods in response to the question: "In order to keep up to date with the latest development in my field I regularly...". The list which followed was designed to be comprehensive in covering the four KUTD behaviours (searching, browsing, monitoring and chaining; Table 5), as well as the active and passive approaches and the online and offline modes. The 26 methods were identified without using technical terms and were organized under nine headings to facilitate understanding and to allow participants to read and choose quickly. Responses were on a five-point scale of frequency ('Never', 'Rarely', 'Sometimes',

‘Often’ and ‘Very often’) to measure the usage of particular KUTD methods and to determine which were most commonly used. The options were grouped as follows Appendix 5:

- Academic tools (AT): “Academic databases or bibliographies” (such as Science Direct, Web of Science and EBSCO), “Academic sharing websites” (such as Research Gate or Academia) and “Professional association websites” (such as communication through newsletters and websites).
- Academic journals (AJ): “Online table of contents” and “Set up alert services”.
- People and events (PE): “Attend different events” (such as conferences, seminars and workshops), “Scan lists of papers in conferences” and “Ask colleagues”.
- Library services (LS): “Ask the library staff”, “Visit the library or its website” and “Scan the library shelves”.
- Social media (SM): “Post questions on social networks”, “Use social media websites to follow certain academics or authors”, “Follow the latest research conducted by research groups” and “Follow the latest research conducted by significant independent researchers in my field”.
- Alert services (AS): “Set up alert services to notify me of new papers” and “Alert services and feeds for academic databases”
- Citation services (CS): “Use Cited by Google Scholar to see who has cited papers”, “Use specialised applications to import all cited papers”, “Follow references cited in an interesting paper” and “Follow authors who cited interesting papers”.
- Multimedia (MM): “Look at technical diagrams”, “Watch video clips” and “Listen to audio clips”.
- Other sources (OS): “Use search engine websites” and “Scan Amazon for new books”.

Gathering comprehensive data on the ways in which participants KUTD enabled the researcher to associate particular behaviours with the use of different methods. To conclude, the main techniques on which this study has depended to collect the right data and analyse it in order to answer the research questions have been the use of ITIL, the appropriate design and structure of the questionnaire and in particular, the composition of the KUTD methods question.

3.9 Research Design

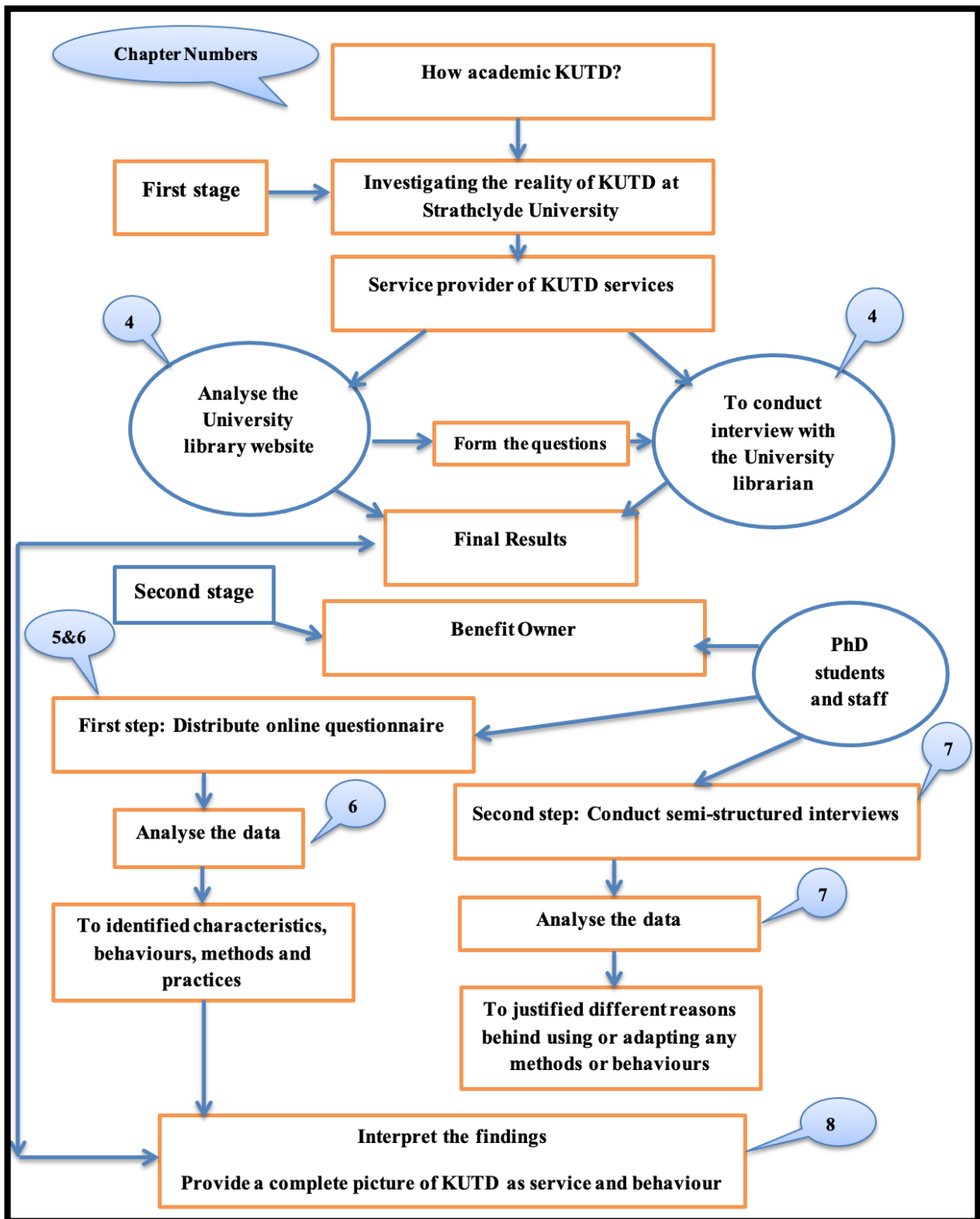


Figure 12: KUTD Research Design

3.10 Summary

This chapter has summarized and justified the research methodology and data collection methods employed in the present research, against the background of those used in previous ISB research. The following chapter focuses on describing KUTD ‘as it is’ and will discuss the University library website and my interview with the librarian. KUTD is a service whose reality is best understood from the service provider’s point of view. I therefore began to investigate KUTD by analysing the library website, followed by an interview with the subject librarian in order to understand how KUTD is provided as a service in Strathclyde University.

Chapter 4: Library Website and Librarian Interview

The first step in this case study of Strathclyde University is to consider the phenomenon of KUTD within the context of the University. The present literature review, has revealed that KUTD should be examined both from an individual perspective, focusing on behaviours or habits, and as a set of services provided by the University library.

This chapter addresses the second of these perspectives, presenting evidence of the KUTD services available via the library website and of the opinions of the Science Librarian regarding the activities undertaken to provide or facilitate KUTD services.

In order to provide a comprehensive analysis of the KUTD information and services provided in reality, it was important to consider the different aspects of KUTD services that an organization such as a university library should provide and to identify their primary elements. In other words, two questions were asked: Which aspects of KUTD need to be identified and investigated? How will these aspects add to the present research?

The present research attempts to answer these questions as follows:

- What KUTD services are available via the library website?
- How does the University library deliver, promote and keep the user engaged with KUTD services?
- Do these services support approaches such as searching, monitoring and browsing?

With regard to the service itself, before conducting any investigations some relevant literature was reviewed to ascertain some essential characteristics of a quality service that can be managed and improved to support users' needs. The ITIL framework was used to identify factors that can be used to evaluate a service in a digital environment, such as a library website, which were then applied to evaluate the library's KUTD services.

The observation and analysis of the library website generated questions and comments that needed further investigation, so clarification was sought in an interview with a University librarian. The interview questions were based on observations combined with the ITIL framework.

4.1 Research Context

To investigate information practices, it is better to identify the context within its organisational boundaries, as compared to everyday life activities (Fidel and Pejtersen, 2004). This method can provide a better understanding of the culture, individual habits, availability of information resources and the role of individuals within the organisation (Leckie and Pettigrew, 1997).

Nowadays, universities are often classed as businesses and students as consumers (Côté and Allahar, 2011). The adoption of this business model has reduced government funding and increased workloads (Ginsberg, 2011). Therefore, to survive commercially, universities must work extremely hard to attract a large number of students, to provide high quality services and to build good reputations.

The University of Strathclyde is one of the UK's leading universities; it is the third largest of Scotland's 19 higher education institutions, accommodating more than 22,000 full time students from over 100 different countries (British Council, 2018). It has four faculties (Engineering, Science, Business and HASS offering a wide range of undergraduate and postgraduate courses and is ranked among the top ten universities in the UK in many subject areas (Strathclyde University, 2017). Its engineering faculty is the largest in Scotland and provides a rich environment for research (British Council, 2018).

The University's Andersonian Library, established in 1796, now has 2000 reader places on five floors, one million printed information sources, over 540,000 electronic books and 239 databases. With a team of subject-focused librarians providing specialised assistance, its mission is to support the University's learning environment by enhancing both teaching and research skills (Strathclyde Library, 2016).

4.2 Strathclyde University's Library website

4.2.1 Introduction

This section begins the presentation of evidence of how Strathclyde University communicates, distributes and supports KUTD services, which must be done before the usage of these services can be examined. An analysis of the library's website provides an opportunity to gauge its effectiveness in communicating KUTD services.

4.2.2 Analysis of the Website

The analysis of its website was conducted throughout February 2016 and there may have been changes to the website since then, for purposes of improvement or maintenance. However, there were no major changes to the library whilst the data were being collected for the purposes of this research.

The website's *Welcome Page* offers links to further information under the following three categories:

- *Help and Support* provides contact details, frequently asked questions (FAQs) and guides for both students and experts on creating a library account and using its services.
- Using the Library focuses on facilities, space and access, reflecting the learning environment aspect of the library.
- Finally, *eResources* is the main section through which KUTD services are delivered.
- The following section focuses on the *eResources* section and links directing the user to KUTD services, namely *SUPrimo* Library Search, *LibGuides: Expert Subject Help*, *Open Access (OA)* and the *eResources* overview page.

4.2.3 eResources

The following five links lead the user to services within the *eResources* section:

- A login interface directs users to a page requesting their library account details to provide access to the library's search system, *SUPrimo*, which can be used to search the collections of both offline and online sources.
- The *SUPrimo* interface includes tips on how to search on *SUPrimo* and provides information about the types of collections offered by the library and its electronic services. There is also a video illustrating how to use *SUPrimo*, as well as catalogues of UK libraries.
- A link to expert subject help refers the user to different subject library websites.
- A link to OA provides unrestricted access to peer-reviewed documents such as academic journals, conference papers, book chapters and research data (Strathclyde Library, 2016).
- A link to an *eResources* overview Figure 13.

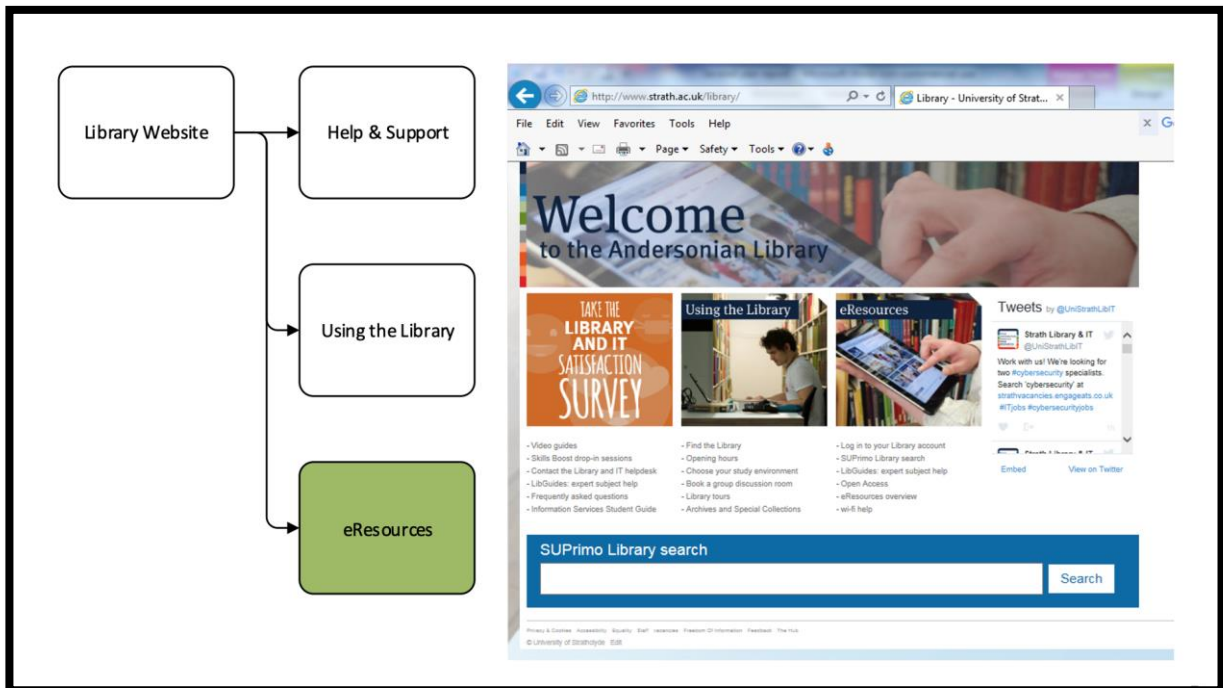


Figure 13: Library Homepage

4.2.3.1 SUPrimo Library Search

SUPrimo can be used as a KUTD tool for academics. The interface offers information services including *Find databases*, which allows the user to search for databases through a specific interface, thus providing a different way of searching. The website also offers guidance on searching for databases, creating a personal database list and using *SUPrimo*, with tips on how to search different types of information sources Figure 14.

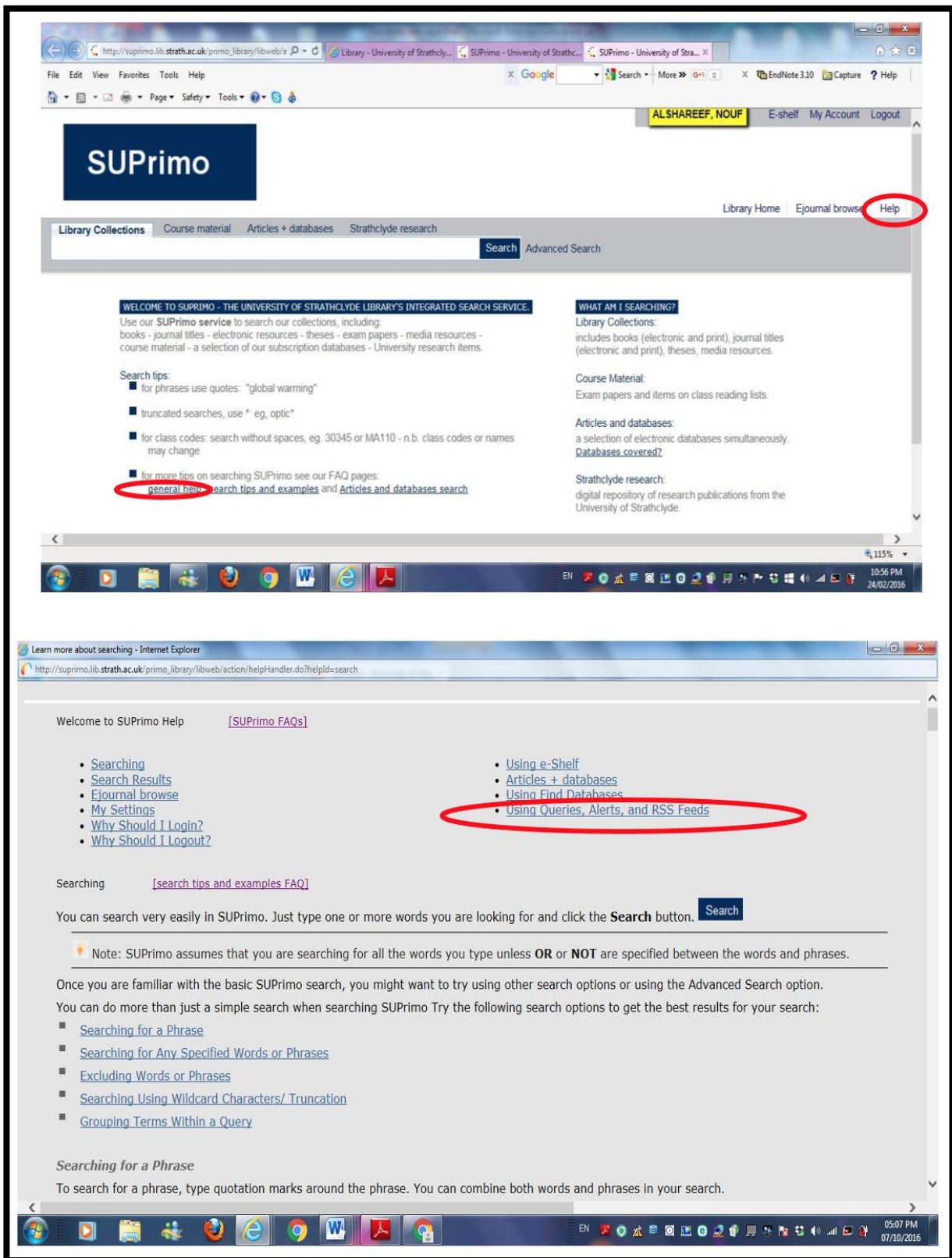


Figure 14: SUPrimo Help Page

There is some evidence of KUTD services on the *SUPrimo* interface. It provides information on KUTD services under *Help*, signposted at the top right of the *SUPrimo* main page, and gives definitions and descriptions of an alert and a query, in addition to explaining how to activate RSS feeds Figure 14. However, the KUTD information is very basic and does not teach users how to set up KUTD services.

The RSS facility was found not to work as expected, as a search for more information via the link leads users to Internet Explorer RSS. The *SUPrimo* interface also has a general *help* link, including the question *Can I set alerts for new items in which I am interested?* However, the answer provides almost the same information as the *Help* section which shows how to get to the RSS feeds. Overall, information on KUTD services was found to be difficult to access on the *SUPrimo* interface; there were no obvious links or categories and most KUTD information was duplicated via two different links.

4.2.3.2 Approaches to Accessing of KUTD Services

This subsection concerns whether KUTD can be facilitated by any of the four established approaches: searching, browsing, chaining and monitoring. Searching is promoted on the *SUPrimo* interface, which provides a list of items that can be searched, search tips and different information sources to be found when visiting the library or using the website. Most of the subject library webpages contain evidence that searching services are supported. They provide varied information on features, such as different types of library collections and search guides, as well as help and support notes which remind users that the library gives help and can answer any questions related to searching its collections.

Browsing can be carried out physically among the library shelves or electronically via *SUPrimo*, where *Ejournal browse* allows users to browse academic journals by title. However, the *Ejournal* section of the website does not mention KUTD services or provide a table of contents, which would facilitate browsing.

Chaining will not be discussed here, as there is no evidence that it is facilitated by the library website, while monitoring is discussed in (Section 4.2.3.3 *LibGuides*), because this reflects the context and follows the order of the library website.

Figures 15 and 16 summarise the functions of the library website and the services offered by the *SUPrimo* interface.

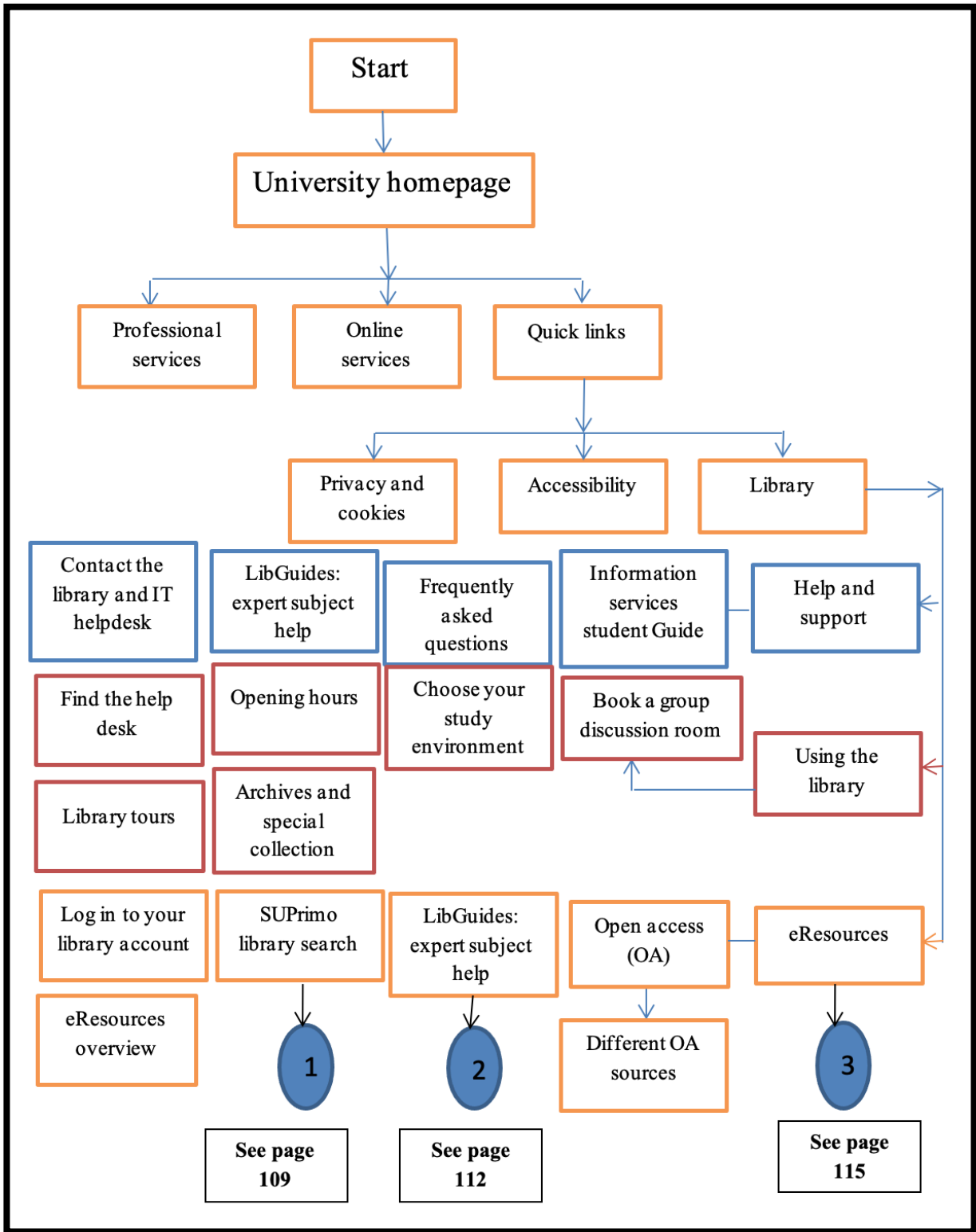


Figure 15: Web Site Map Showing Functional Hierarchy

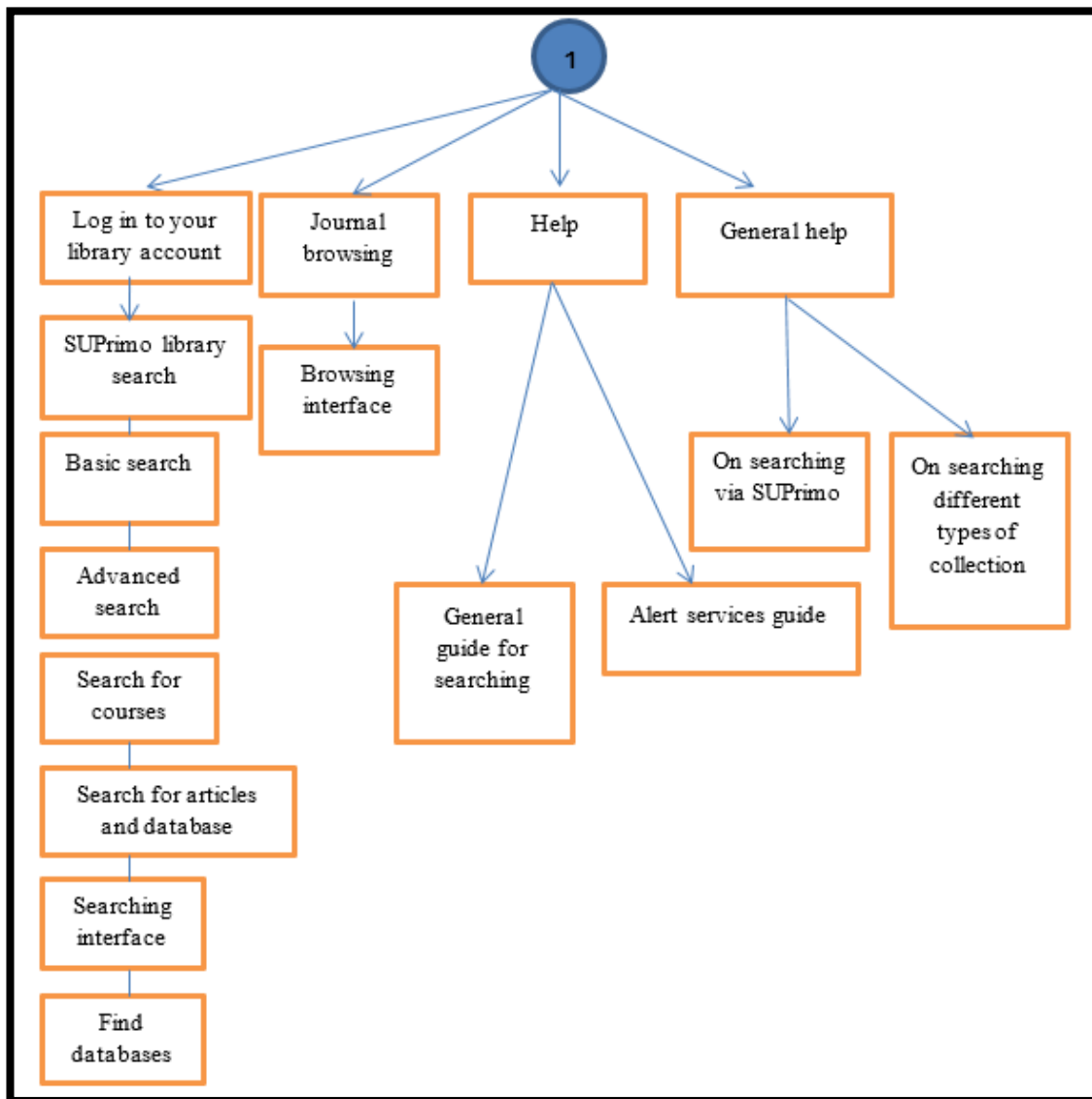


Figure 16: Website Map- SUPrimo Library Search

4.2.3.3 LibGuides: Expert Subject Help

The subject webpages include two sections: *Science and Engineering* and *Humanities, Social Science and Business*. Evidence of KUTD services under the link *LibGuides expert subject help* is very obvious on the *Science and Engineering* library webpage, which has a link under ‘*Help guides*’ or ‘*Guides*’, where a further link called ‘*Where do I start?*’ explains how to set up alert services for different resources Figure 17.

On the *Science and Engineering* webpage there is a section called *Research support* under a link entitled ‘*Information skills for researchers*’, leading to an external webpage run by the

Open University which provides a ‘keep up to date’ service. The Open University is a public UK university providing a distance learning environment for undergraduates (Gourley and Lane, 2009).

Conversely, on the library webpages for *Humanities, Social Science and Business*, there is no evidence of KUTD services. However, on the information services page, under the category of research support, there is a link called *Information skills for researchers*, which again leads to an Open University webpage Figure 18.

Under the *Help* heading there is a KUTD link which includes alert services, using RSS feeds, journal alerts such as Zetoc, TOCs, JOPML, citation alerts and book alerts. The website also provides alert services for news and mailing lists.

Figures 19 and 20 summarize the KUTD services found on subject webpages. These predominantly concern alert services, representing the monitoring approach, which can be adopted by following various links that can be reached in different ways. Table 6 lists the different forms of monitoring available via the library website. The KUTD services on these webpages are supported by set-up guides, but there is no further guidance to help users if they have problems or struggle to use the services.

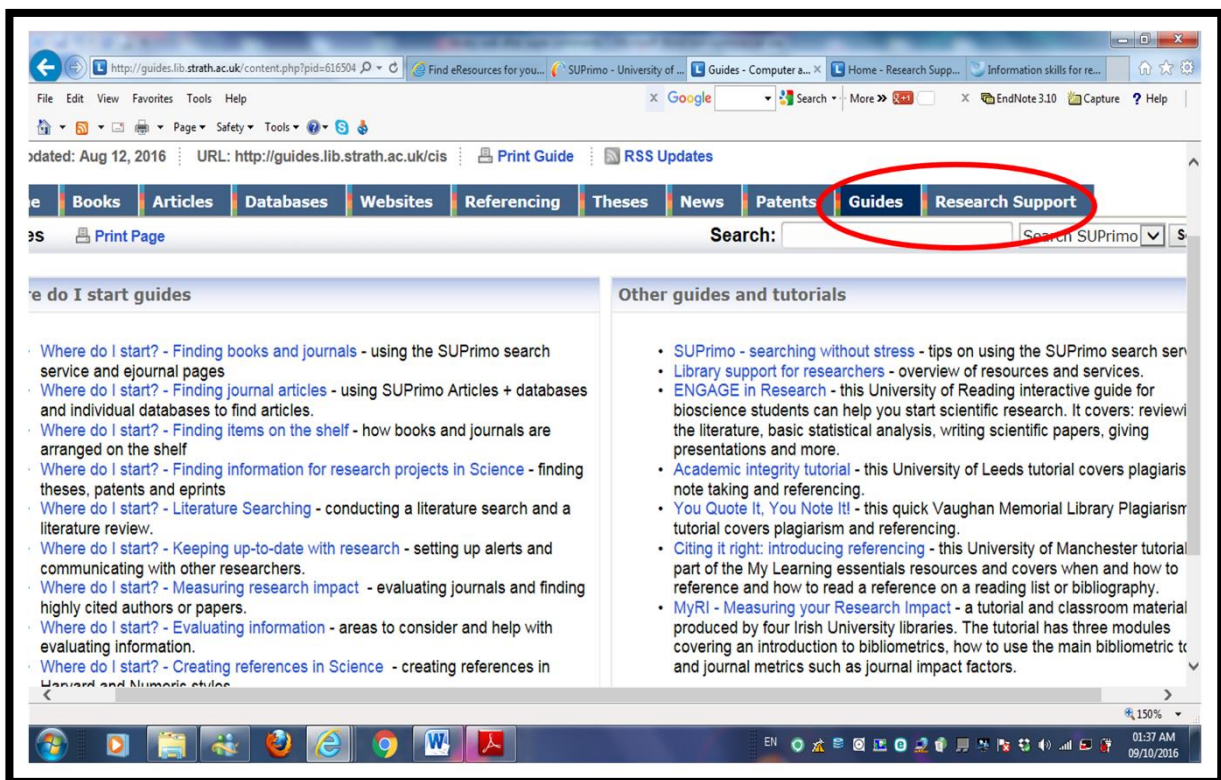


Figure 17: Computer and information Library Webpage

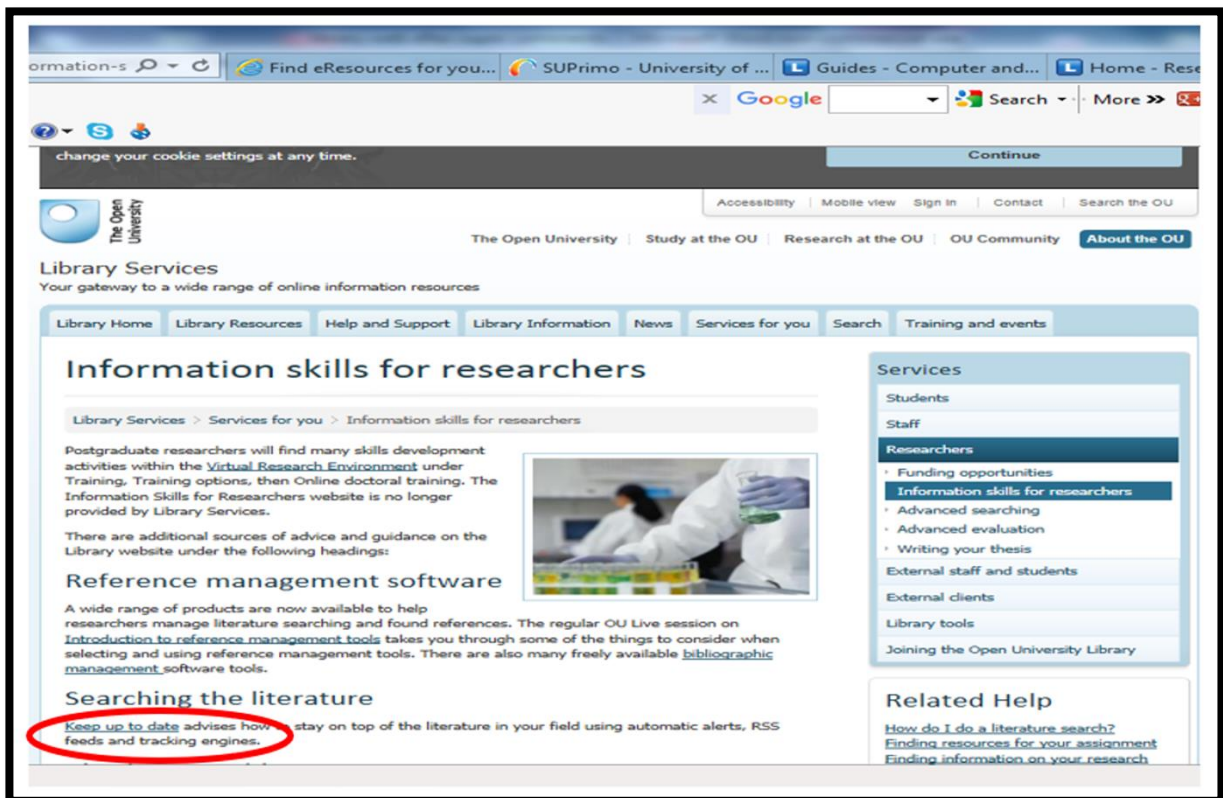


Figure 18: Open University KUTD

The Andersonian library provides a variety of database subscriptions that ensure full coverage of different types of information sources and fields. An example is ProQuest, a popular multidisciplinary database included in the e-resources and covering business, health and medicine, social sciences, arts and HASS, education and science. WoS is a core collection of scholarly journals and books in the sciences, social sciences, arts and humanities, while Zetoc is a database giving access via the British Library's Electronic Table of Contents to a wide range of academic journals and conference papers.

Most such databases provide alert services, but these are separate from the KUTD services found on the library website and each database has its own setup and use procedures. Various academic journals also provide this service. Most of the alert services offered by databases and academic journals represent the monitoring approach to KUTD.

Alert Services for KUTD	Examples
Databases	ProQuest Web of Science Zetoc By Keywords or Author
Journals	Elsevier Science Direct Zetoc By Table of Contents By Keywords or Author
RSS	Database Journals Library
Books	Blackwell
Research Profile	ORCID ID Research ID.com Scopus
Communication with others	Blogs Email Discussion Google Groups JISC mail Catalist

Table 6: Online Monitoring Methods

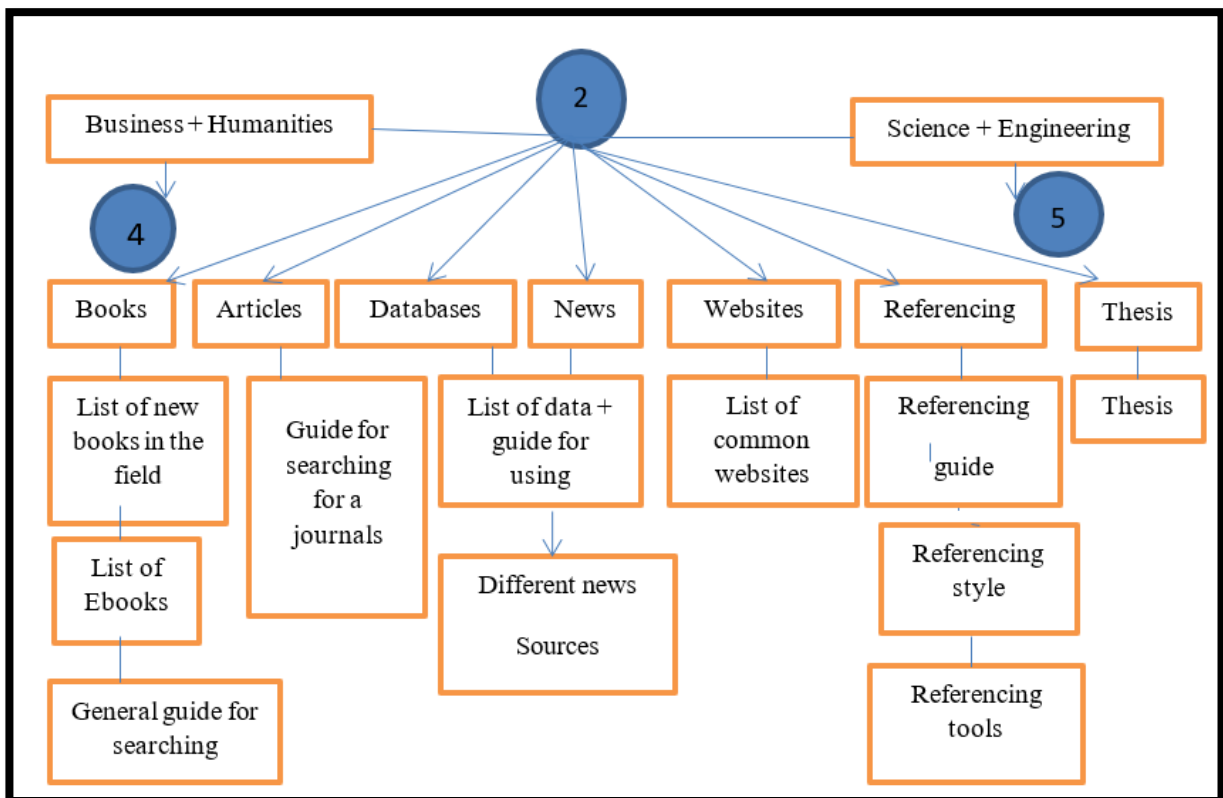


Figure 19: Subject Library Website

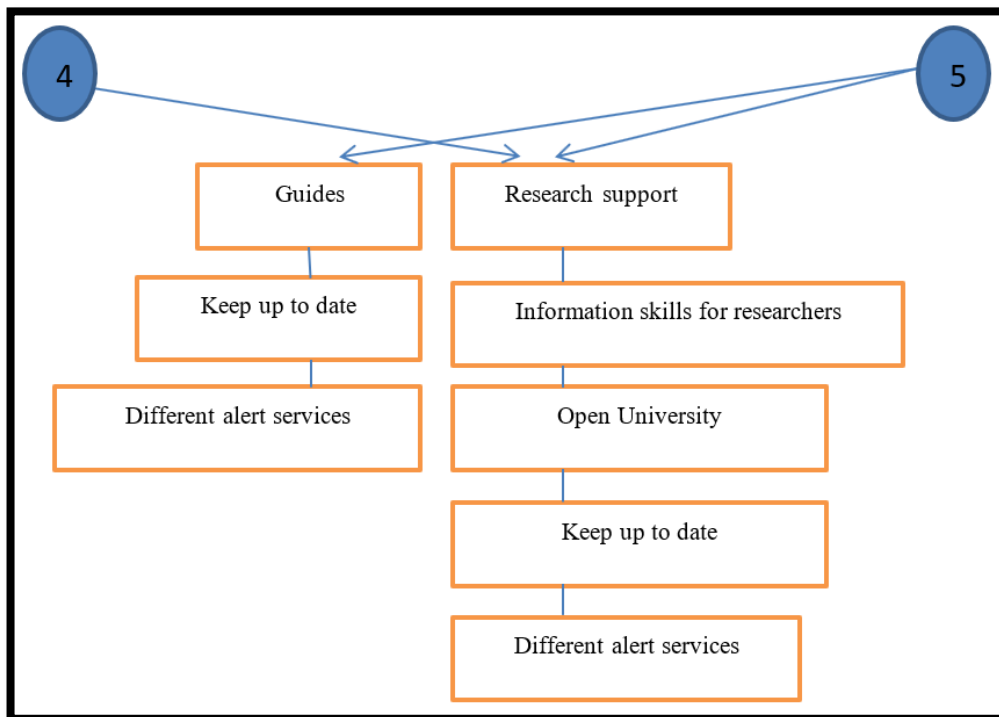


Figure 20: KUTD in Subject Page

4.2.3.4 Open Access

There is an OA link which can be reached via the eResources link on the Welcome page. It opens a dedicated page which contains a definition of OA and further links to related categories such as OA resources, OA communities, funders' policies and FAQs. In terms of KUTD, searching OA on the library website provides the user with a variety of OA sites, each of which has a different policy and way of using and searching it.

Some of these sites mention KUTD under the RSS service, but the library website provides no information or guidance about how to set up and use the services or support KUTD; it also fails to invite users who need help to contact the library via the OA section. Nor does the library website explain that KUTD services are available under different OA sources. In conclusion, the library website does not support KUTD through OA.

4.2.3.5 eResources Overview

This final link on the eResources page takes users to a list of links to specific resources, providing various types of information, called *eResources Overview*. For example, the link to *eBooks* provides information about the number of *eBooks* available through the library, the printing regulations and an *eBook* guide. The latter provides further links to pages giving

information about how to access and use specific *eBook* websites, with each page varying in the type and format of information. For example, some contain videos, while others provide screenshots and icon descriptions. In contrast, the *Ejournals* link provides further links which enable users to search the collection in different ways, by article, subject, journal title or publisher. These searches ultimately take users to different external websites with diverse tools and facilities.

The link to databases provides links to pages containing catalogues and highlights of each database. It describes frequently used databases and provides tools such as help and guides for using the databases, along with facilities such as alert services. Most but not all of the resources on the *eResources* webpage provide KUTD services such as alert services. These KUTD services differ from one another and each resource has different steps to set up alerts.

As well as those mentioned above, the library website offers a wide variety of resources including maps, atlases, newspapers, serials and thesis collections Figure 21.

Users can search the *eResources Overview* for KUTD using different resources. Searches can be carried out online or offline, such as by visiting the library or seeking a librarian's help.

The *eResources Overview* main page mentions no KUTD services, but has links to information about available resources; for example, a page entitled '*What's new*' lists archives, collections and other *eResources* to which the library has recently gained access. However, there is no evidence of KUTD services that would facilitate searching, browsing or monitoring such resources. Consequently, help in using KUTD services is not offered, although the page does mention that help in searching a user's subject area is available from a librarian.

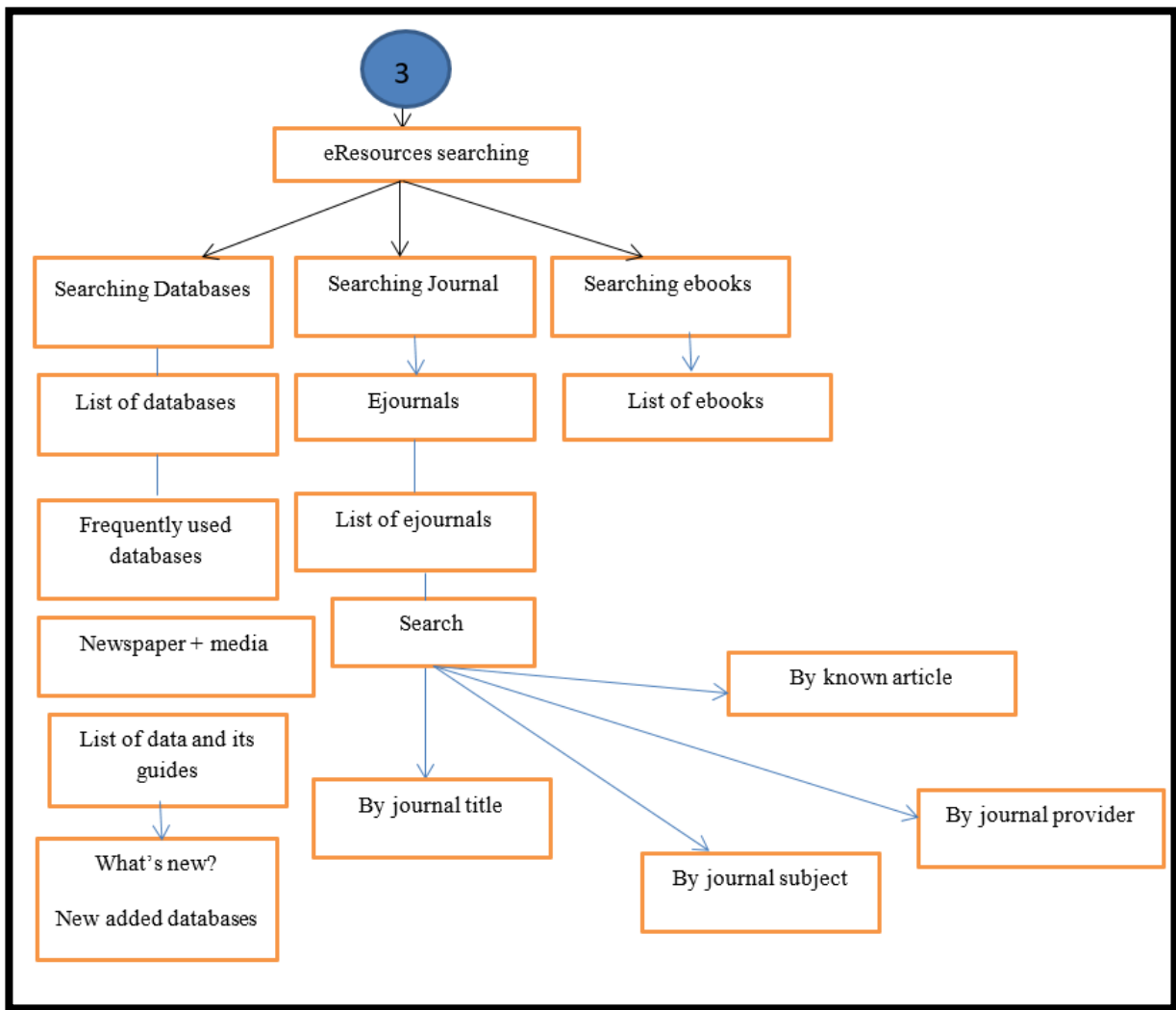


Figure 21: SUPrime Search

4.2.4 Use of Social Media to Promote KUTD Services

The library uses Twitter to describe services and give general information on matters such as opening hours, the IT satisfaction survey, how to seek help from the library and, most importantly, details about Skills Boost, a programme of teaching sessions on referencing and plagiarism, using *SUPrime*, *eBooks*, Google and Google Scholar. Despite these facilities, the library offers no training on how to use KUTD services, nor does the Twitter account mention the KUTD services on the library website.

The final attempt to investigate evidence of KUTD services on the library website consisted of typing 'keep up to date services', 'content awareness' and 'alert services' in the search box

on the library's main page. These searches led to many different items, none of which referred to KUTD services.

4.3 ITIL and Library Website

As mentioned before in the methodology chapter, ITIL provides different categories of lifecycle service management, some of which can be useful in assessing the KUTD services on the library website. The following subsections provide details of each category that was used in the evaluation of the Andersonian library website.

Among the different approaches to KUTD, there is evidence of general support for searching on the library website. There are links to contact details which enable users to access help and support services, links to guides and a variety of library collections available to be searched. However, there is limited support for KUTD services that facilitate searching.

The website contains a page which gives details on browsing academic journals and TOCs, but no help or support guides for KUTD services are provided. Monitoring is supported in a variety of ways, such as offering different types of KUTD alert services, providing guides and offering help. However, there is relatively little effective communication with users regarding these services.

4.3.1 Services Design of KUTD

Service design has many aspects, one of which is service delivery, and the library website provides inadequate delivery of its KUTD services. It neither clearly defines KUTD nor explains why it is important; it does not describe the different possible KUTD strategies and it offers no guidance and help service to facilitate or explain the use of KUTD services. Currently, information about KUTD services is not easily accessible, as it is spread across the entire website and involves following many different links.

Furthermore, although the library website does deliver KUTD services, there is no evidence that it provides basic support, such as reminding users that the service exists; nor is there any evidence that it provides support which is constantly monitored by feedback and suggestions to ensure its continual improvement. Finally, little information is provided in terms of user guides or help pages and links, which means that the usability of KUTD services is generally inadequate.

4.3.2 The Service Transition of KUTD

The website provides little awareness of KUTD services, such as reminding users that librarians can give help and support. Further help could be provided via training sessions on KUTD services, which would be easy to implement since the library already runs a training session called Skills Boost. Training on KUTD services could be added, if KUTD-specific training sessions were not feasible.

4.3.3 Promoting the Services of KUTD

Social media could be used to promote KUTD on the library website and on all subject pages, but this is limited to announcements relating to generic library news and events. There is no evidence that Twitter is used to promote KUTD services at all. Using social media to promote KUTD services would offer many benefits, such as improving users' engagement in research and the disseminating of information amongst peers. It could also support collaboration between academics and create awareness of research, as well as having an impact on the wider, non-academic community, by making larger audiences aware of any research that is taking place.

4.3.4 The Service Operations of KUTD

The library website does not provide a service desk as a single point of contact between users and service providers where help and support could be obtained. Such a service would allow users to ask questions, raise concerns and seek advice. It would also allow the library to deal with problems and provide an interface for different activities such as the maintenance of services.

4.3.5 The Imbalance of KUTD

There is an imbalance in the provision of KUTD services across the various disciplines. For instance, more support services are provided for Science and Engineering than for Business and HASS. Moreover, such support is offered by the Open University rather than by Strathclyde University. There may be many reasons for this imbalance, for example that scientists and engineers tend to use KUTD services more than other academics, or that more

research is published in Sciences than in HASS. However, the definitive reasons for these imbalances are unclear and thus require further investigation.

4.4 The Librarian Interview

The overview of KUTD services provided by the Andersonian Library website presented above raised questions which could potentially be answered by a librarian, concerning, for example, the evident imbalance in provision of KUTD services between Science and Engineering on one hand and HASS and Business on the other, or why information related to KUTD was spread across multiple web pages. To answer these questions and others arising from the website analysis, an interview was conducted with the Science Librarian, selected primarily for her shared background with the researcher, who was studying in the Science Department. There being little difference in work systems or procedures, the science librarian was able to represent all subject librarians at Strathclyde University.

The interview, which lasted around an hour, was conducted in the library meeting room, at a time and location chosen by the interviewee, whom the researcher had emailed in advance to outline the present research and explain the need to seek a librarian's help Appendix 2.

As noted above, the ITIL framework was used to evaluate the service provided by the library website and to develop the interview questions. The case study was used in analysing the interview; the first step was to document the information gathered from observations of the website, then interview questions were generated with reference to the main ITIL categories and aspects thereof. For example, aspects of the service design category include how to deliver, support and improve services. Among the questions in this category, some were factual, while others sought explanations for the lack of information about the service or clarification of the presentation of information in a particular way.

The above steps were then repeated for all ITIL categories, generating ten questions which were put to the librarian. This enabled the findings to be summarised, as outlined in this chapter, and put into context, in order to derive a strong explanation of how the library presents KUTD services.

Throughout this section, the term 'content awareness' (CA) is used to refer to KUTD services, because the librarian used it during the interview.

4.4.1 Delivering the Service

The library and its website were found to provide information resources covering a wide range of content. However, analysis of the website reveals an apparent lack of clarity in information about content awareness, with services being inadequate, difficult to find and of low usability. The need to understand why this was the case and why information was presented in this way on the website led to the following questions being put to the science librarian, beginning with a general enquiry as to service provision:

1- What content awareness services does the library provide?

The librarian appeared reluctant to define CA as a service and which may explain the uncoordinated appearance of CA material on the website. The librarian alternatively justified the weakness of online service provision with reference to various methods of making staff and students aware of a range of contents, including the channelling of information through individual subject librarians.

“I don’t know if you’d define it as a service as such, but we do some things to keep people up to date about what’s happening in terms of new resources and new information that’s relevant to them”.

“All of the departments in the University have someone who’s the kind of liaison point between the department and the library, so a lot of the information is channelled through that one person and then they will then channel it on, in whichever manner they feel appropriate.”

The librarian explained that lists of new content such as publications, emails, books, journals and databases were sent by library representatives (reps), each responsible for a specific department, to ensure that up-to-date information was communicated to staff. These reps would choose the most appropriate methods to share information about library resources and to deliver content to staff, whether electronically or on paper.

“A number of the subject libraries send lists of publications in the area to staff. We also just email if we get new content into the library, so if we get new books or new journals or new databases or new e-book packages then we often email the library reps. Each of our departments has a representative who looks after that particular department.”

“Some departments might have a staff newsletter that goes round, some might use email lists and some might have Facebook or a blog or something like that; but if we send the information to the reps, they can then decide what they want to do with it after that.”

The librarian added that while methods would vary among departments, the main objectives were to provide guidance and direction for users and to send the most relevant content to staff. Direction or filtering of content would differ according to the nature and behaviour of individual departments, as illustrated by her comparison of computing and information sciences with HASS:

“So rather than the staff having to find things and then order them, we’re kind of directing them towards what might be relevant and it varies from subject to subject.”

“Because some staff like computing and information studies, you may be quite used to doing that yourself, but maybe in other areas, maybe humanity areas, when there’s a lot of material to go through, the librarian may be filtering it a bit before sending it out. It makes it a bit easier for people to choose publications.”

Other methods of delivering CA services included monthly book reports sent by some subject librarians, although the science librarian had ceased to send these because they were not needed:

“We run a new books report every month and again some subject librarians send this out. I tried it for a short amount of time, but they didn’t really need to know and I think they were finding out themselves kind of what new books had been added. Again, it’s on a subject-by-subject basis. Some subject areas may require that more, so it’s just a report we get from the catalogue and then”

All previous examples clearly show how the nature of particular departments determines their CA service needs.

In addition, to the new books reports, the librarian mentioned the “*What’s new*” page, accessed via the *eResources Overview* page of the website (section 4.2.3.5 eRsources overview), listing archives, collections and other electronic resources such as databases, books and journals. While stating that this tends to be updated frequently, the librarian explained that this was a hidden and flat page and recognised the need to redesign the website in order to make such services easier to find and more stimulating:

“We’ve got a page on the website, but I do think it’s a bit hidden. It’s called What’s new, but I think trying to find it’s probably the problem to start with, although we are going to be redeveloping our website in line with the university brand, so that is something that will be happening at some point, and on the what’s new page we put new electronic resources that are relevant.”

“The What’s new page is under the electronic resources section in the library but I think it’s just a quite boring flat page. There’s no pictures on it. There’s nothing really exciting about it. It’s just telling you we’ve got this, this is what it is, this is how you access it, so perhaps when we get the new website we can look at making it a bit more”

Following this discussion of how the library provides CA services, it was important to investigate the existence of any policy or strategy for doing so, none having become apparent during the investigation of the library website. This formed the basis of the next question.

2- Is there a library policy or strategy to provide content awareness services? If so, how do you evaluate it?

The librarian replied that the library had no policy or strategy on how content services should be provided, explaining that the library tended to take an independent and decentralised approach to service delivery, consistent with the University’s policy.

“I’m afraid to say we don’t have a policy or strategy no”

“I think the University is very much independent and its staff have quite a lot of academic freedom to manage things the way they’d like to be managed in their subjects, so it’s not been very centralised in this university and I think the library perhaps operated the same way. It was very much do what you want in your subject area.”

However, the librarian stated that there were general policies to ensure that all students would have similar experiences when dealing with the library:

“We do have more policies and strategies, because we’re trying to be a bit more uniform in what we do, so students for example get the same experience. So if they come to be a student in HASS they’ll get the same induction as they would if they were a student in Business, because before it depended on what department you were in, you know, what level of contact you got with the library, so I think it’s maybe the same in this area. It’s maybe not been thought we need to have a policy. It’s maybe just not come up before.”

Thus, the library’s broadly decentralised approach left individual subject librarians free to decide on the content of the various webpages. Notwithstanding the general policies and strategies that all librarians must follow, there was no strategy for CA services, so librarians could deliver services as they saw fit.

“On the webpage the subject librarians have the freedom to update their own pages and put up on the pages really anything they want to. We have a kind of general framework, so we’ve decided the tabs that are definitely going to be there, for example databases, books. So there’s the referencing ones. So there’s some things that are definitely going to be on the pages, but beyond that people can really have the freedom to do what they like, really, so it’s not controlled.”

Having elicited the librarian’s perceptions of how the library delivers CA services and how the website is organised, the next step was to enquire about possible improvements to the delivery of these services.

3- Are there things you would like to improve about the delivery of content awareness services?

The librarian suggested that, an examination of the practices of other university libraries, might help to improve CA at Strathclyde.

“Well, I would like to find out a bit more about what other libraries do and what they offer and if we’re able to do something similar here, but that’s a lot of the way that libraries work. We have a look round to see what others are doing and our - we won’t call them competitors - maybe collaborators or colleagues - at Glasgow or Edinburgh and see what they’re doing in a particular area and then we think: Oh yes, that looks good, and sometimes we’re ahead of the game and sometimes we’re behind.”

4.4.2 Promoting the Service

Service promotion can be implemented in many different ways to make users aware of services. Analysis of the library website revealed the use of social media to publicise generic library news and events, although there was no evidence of this being used to promote CA

services. It was therefore necessary to clarify exactly how services were being promoted within the University.

4- How does the library make staff and students active researchers and aware of the content awareness services that it provides?

The librarian restated the view that the library had practically no CA services to promote. Social media were used, but to convey general information about the library, not CA services, in particular:

“We don’t have that many content awareness services, so we don’t really need to promote them, because we don’t offer a lot at the moment, but if maybe it did grow, then again we’d have to think about how we’d do this.”

“We do have Twitter and Facebook but I do not think we use it that much for content awareness and I think that is something we could do more in the future. I think social media we could be doing more there in future. We do advertise the courses.”

Having reiterated the need to promote CA services more effectively via social media, the librarian reflected on the possibility that the library had made false assumptions regarding the extent to which staff and students were satisfied with the effectiveness of their own research networks:

“In a lot of ways I suppose, with the advent of the internet, the staff have been doing a lot for themselves. Now they have their own groups or their own research networks. They use Twitter and Facebook, so maybe we’ve assumed wrongly that people are doing it for themselves, I think particularly research staff and research students, and we think if we’re not hearing from them maybe they’re quite happy doing that, but that might be a wrong assumption. Maybe they’re not happy doing it. Maybe they do need help.”

4.4.3 Supporting the Service

An important element of service provision is offering support, such as by inviting users to provide feedback and comments to ensure that their needs are being met. The investigation of the library website highlighted the current absence of such feedback mechanisms, prompting the next question.

5- Does the library receive any feedback or comments about content awareness services? If so, how does it respond?

Apart from negative comments about difficulties in finding material on the library website and more positive suggestions made during training sessions which librarians would recognize as worthy of consideration, feedback tended to take the form of general enquiries by PhD students. The librarian also mentioned an increase in queries about using Endnote.

“Occasionally people will say things like ‘We can’t find something’, or if we go on a training session, someone will ask about something and you think ‘Oh, that’s a good idea’.” Also, some questions about setting up alerts, for example, or how to do that, or which databases to use for their area, or how to keep up to date with content that’s been added. It tends to be mainly PhD students like yourself”.

“People have asked more about Endnotes so we’re doing an Endnotes page. We have a referencing page but we’re going to expand it out and have a page on Endnote and Endnote online and more guides up there”.

On the whole, feedback tended to be limited to users with strong opinions, while the views of the moderate majority were rarely heard. The library did obtain some feedback from student surveys, but this mainly concerned general issues unrelated to CA, or indeed any particular library services, and provided no clear evidence on which to base improvements.

“Usually people that feedback are either people that are very happy or people that are not happy, but the middle people tend not to say very much.”

“We do a student survey every year, but I don’t think anything really has come out that’s relevant to this side of things, you know the guides. It’s more like ‘Oh, we don’t like the toilets’, or it’s too noisy on level five or it’s too quiet, so it’s deciding when you change. Is it because it’s the majority of people would like this or it’s just one person?”

Given this lack of useful user feedback, the librarian expressed interest in identifying methods for improving its collection and ways of implementing these methods

“A way to get more feedback would be good and we need to look at how to do that.”

In order to deepen understanding of the library’s CA services, it is important to identify the level of priority and importance afforded to them. This prompted the next interview question.

6- How are content awareness services prioritised compared to other library services?

This the librarian’s response reemphasised the sparse, ad hoc nature of the library’s approach to content awareness, based mainly on responding to specific queries. Despite not prioritising CA services, however, the library did want to ensure that users were aware of its information resources and also, to determine whether staff and students needed help or could manage to navigate the library website themselves.

“I presume from the fact that we don’t do much on it that it’s not a top priority, because I don’t think we have like a service as such, so it’s not embedded in what we do. It’s more kind of ad hoc. If someone asks for something then we’ll react and we’ll do it, but I do think it’s important that staff and students are aware of what content we have, what we provide. I think we do try to make staff and students aware of what we have.”

“But again I would be interested to know, is it sufficient for people to be doing it for themselves, or do they need more help and what help do they need? What aspects do they need help with? Is it the setting up? Is it the monitoring? I don’t know”.

4.4.4 Engaging Users with the Services

The analysis of the library website found nothing about service training sessions. If the library did provide any CA sessions, these would be either online or offline, so the following question was asked.

7- Do you provide any online or offline sessions on content awareness? If so, how do you publicise these?

The library response was that the library provides no such sessions unless staff or students specifically request them. However, if the library finds that users are struggling with a certain issue such as referencing, which is one of the most frequent subjects of enquiries, then it will offer help. The LANDesk system of monitoring enquiries allows the library to decide to provide particular sessions, depending on the number of enquiries it receives.

PhD students are the users most likely to enquire about setting up alerts or to seek suggestions on which databases to use and these are normally addressed in one-to-one sessions that are not specifically focused on content awareness.

“No, we don’t. If someone contacted us and wanted something then it would likely be a one-to-one, unless we saw that there was a market there to provide more. Sometimes we find that people are struggling with something like with referencing. That was where we got more and more enquiries from students, from staff and from postgrads and that’s why we’re starting concentrating more on offering help with referencing. So if maybe we found that we were getting more enquiries then our help desk does have a system that they use to monitor enquiries, called LANDesk, so they can actually go back and see what enquiries have come through and you know what the peaks are, so is everyone asking about how to find a book, or is everyone asking about content awareness services?”

“Some people will ask about setting up alerts, for example, or how to do that, or which databases to use for their area, or how to keep up to date with content that’s been added. It tends to be mainly PhD students like yourself that come and ask that and it’s part of a larger session, so I would do a one-to-one with them.”

One element of service transition is the provision of training sessions to inform users on how to engage with the services available. However, following the investigation of the library website it transpired that all training sessions provided by the library are generic and not focused on CA services.

8- Do you train staff and students to be active researchers in content services? If so, how?

Given the generic nature of the training it offers, the library still needs to consider several factors in relation this provision. The scheduling of training sessions, which may take one or two hours, will depend on the librarians’ availability and their frequency is based on demand and the type of training session. Having reiterated that there were currently no training

sessions dedicated specifically to CA, the librarian intimated that if specific training were required or if there were strong demand for a particular topic, then the library would consider providing booster sessions for it.

“I think just as part of other things that we train on, so it’s part of a general session”.

“So if I’m training I don’t get a lot of time with students. You maybe get an hour session. Sometimes you get two hours. Sometimes you get repeat sessions. It depends on the staff and on the timetable, how tightly timetabled students are, if it’s top postgrads for example, and how much the staff do themselves in the department. Some staff may be doing this for students. I know some used to teach referencing and SIPBS. They would cover that area. I know some taught referencing and CIS, so it’s possible staff could be doing it as well.”

“We could have a content awareness skills boost session if that was required, if we thought there was a demand for it. At the moment really what we do is we provide a more encompassing session - on different areas and that may be part of it, but it’s not specifically just about content awareness. And the other thing is just putting some guides available online for people to set up alerts themselves, but there could be other things that we could do.”

The next interview question concerned ways to evaluate the quality of CA training sessions, to establish whether they were deemed useful.

9- Do you have ways to measure the success of the content awareness services, e.g. do participants then follow up later?

The librarian’s response showed that evaluation was no longer routinely performed. Evaluation forms were used to elicit attendees’ feedback on selected training sessions, yielding information about positive and negative points of the training and highlighting any changes they felt were needed, but the librarian emphasised the need to learn more effective ways of gathering genuine feedback from users in a situation of increasing survey fatigue, because of the importance of understanding exactly what staff and students want.

“I used to do evaluation forms and I looked after every session, at the end of the year, what people were asking for what they found out from it. Name two things that you got out of this session, two things you’d like to change about this session. It was getting a bit too much, so I now kind of pick and choose which sessions I want feedback on. Its maybe something new that I’m trying and then I’ll ask for feedback after that and hope that they’ll be feeding back to their tutor with anything else. Also, I don’t know what’s the best way to get this feedback . Sometimes I’ve had Post-its and I’ve asked people to put Post-its up on the wall, because that’s quite quick to write a Post-it rather than write a full form or do something online”.

“I’m kind of needing guidance myself on what the best way to get follow-up from people would be, because people will fill it in but you just wonder if they’re just going like this [makes motion of blindly ticking boxes] so they can get ahead and go, I think finding out more about what people want. It’s best to do that because as I say sometimes they get surveyed out. They get so many surveys now on so many different things and it’s trying to engage them more and more.”

Meanwhile, if staff and students were interested, they would provide feedback, which can be the most effective way to evaluate the quality of a service.

“If it’s something you’re interested in then you’ll fill it in and then you’ll send it back if you think it’s going to be useful, but people are just strapped for time. They’ve got so many other things to do that they think ‘Oh, it’s another thing to do. I’ll leave that bit of email or whatever.’”

Nothing was found on the library website about strategies for encouraging users to engage more with the services, which led to the librarian being asked this final question:

10- Do you have any strategies to engage academics with content awareness services? If so, can you give examples?

The librarian thought that social media could be used in relation to CA, although the library needed to bring itself up to date with developments in that area. As mentioned before, social media was used to inform students and staff about current and future events at a rather general level.

“I think really I’d like to find out a bit more about how social media can help with content awareness, because I think we are behind in that area. We’ve used it kind of to inform people about what’s happening, what’s coming up, but not really used it so much to make people aware of what or how to keep up to date in their area, and I think it’s something we’re going to start looking at. I think we probably need to find out more ourselves before we start telling other people what to do.”

Table 7 summarises the main interview findings regarding the content awareness service. A more comprehensive account of the findings is given in Table 31 Appendix 4 and the interview transcript in Appendix 3.

Service	Description	Support	Details
List of publications	A number of subject libraries send lists of subject-specific electronic or paper publications to staff.	Information is filtered and help provided.	
Email new contents	New content is emailed to the library rep, who passes it on via different channels.	New content is disseminated via different channels.	Staff newsletter, email lists, Facebook or a blog.
New book report	A monthly report is sent out by some subject librarians.	No support provided, as this service has been discontinued.	People can find it by themselves.
Library webpage	The webpage is hard to find. The library wants to increase awareness of the webpage.	Not mentioned.	The page is quite dull, without pictures or an engaging layout.
Informal group	A social get-together between librarians and academics.	Not mentioned.	
Meeting new staff	List of new staff.	Help is provided.	Tell the librarian about your research and they can tell you about new publications and set up alerts.
Twitter and Facebook	Social media are not used to promote content awareness services.	Not mentioned.	Only one person is responsible for content and updates. The library is unsure how to use social media or increase user engagement of content awareness services.
Setting alerts	Zetoc and ProQuest are used. There is no personal content awareness form.	Guide	Bigger services and more coverage.

Table 7: Summary of Main Interview Findings

4.5 Summary

From the investigation of the library website it can be concluded that the availability of information relating to KUTD services is limited. The information that was found on the website was verified by the librarian during the interview.

With regard to types of KUTD behaviour and approaches, the library website supports monitoring by providing alert services and guides on how to use them. In terms of searching and browsing, the library offers a variety of both online and offline resources, but does not mention that users can use KUTD services through these resources. On the website, academic journals can be browsed by subject, title and keywords. The website also provides the TOCs of e-journals, but again it fails to mention how to use KUTD services. Overall, all potential KUTD behaviours have been recognised, but it does not support KUTD services.

As to the delivery and accessibility of KUTD services, it became clear that the library does provide its own KUTD services to help users become aware of it. It does not define KUTD as a service, but it takes a number of steps to make users aware of different contents. The various methods used to deliver content to different departments include the distribution of email and paper lists, as well as Facebook, blogs and staff newsletters. Thus, individual departments use methods that suit their nature and requirements.

The investigation reveals that services are made relatively inaccessible by being spread around the website, rather than being accessible on one page or via obvious links. This weakness was acknowledged by the librarian, who identified it as an issue which needs to be addressed in a future redesign of the website.

On service design, it was found that there were no descriptions or definitions of KUTD services, no explanations of their importance and no detailed instructions on setting up or using them. This was confirmed by the librarian, who stated that there were, in fact, no specific designs for KUTD services.

Not having KUTD services means that no such services are promoted, although the library uses social media, Twitter and Facebook to promulgate more generic information about the library.

Regarding service support, the library provides general training sessions. However, no specific training sessions are offered on how to use KUTD services. In addition, the library was found not to provide access to an online help desk specifically designed for KUTD services, where users could seek advice, actively communicate problems, or provide feedback. Currently, the only way that users can discuss KUTD services is by talking to the librarians in person or via email. However, this is not explicitly stated on the website, but requires the initiative of users to seek out help for themselves.

There is no follow-up support for those services that are provided and no mechanism for users to provide any feedback or evaluation forms routinely available. A further issue concerning feedback is that most of the comments received by the library were said to be from a few PhD students asking about how to set up alerts. No feedback is given by University staff. Consequently, the library would like to know more about the opinions and information needs of staff and students in order to provide the services needed. The library falsely assumes that if it does not hear from users or receive requests for help, this indicates that they are happy with the service and are experiencing no problems in using it, when in

reality it merely reflects the poor communication of users' needs because the library does not maintain formalised communication channels with them.

In conclusion, the interview questions, formulated from the findings of the investigation and analysis of the library website, raised a variety of points requiring further investigation. For example: Are users aware of KUTD services at the library? Do users manage to fulfil their information needs, or do they need the library's help? A questionnaire was therefore designed to address the points needing further clarification and to learn more about users' perceptions. Thus, it is intended that data obtained from staff and PhD students who use the university library may further inform the present research.

The next chapter discusses the questionnaire design and shows how the questions reflect the findings reported in this chapter.

Chapter 5: Questionnaire

5.1 Introduction

The research methodology chapter has described the two main data collection methods employed in this research: a questionnaire survey and interviews. The previous chapter investigated KUTD at Strathclyde University to establish how the university provides KUTD services. In order to ensure an in-depth understanding of the phenomenon, it is essential to examine it from two perspectives: that of the university library as service provider and that of the academic staff and PhD students as benefit owners. It is also important to consider the various aspects of KUTD training and services that can be offered outside the library, for example as part of the departmental training of PhD students in the university.

This chapter therefore focuses on the questionnaire which was used to elicit staff and students' opinions regarding KUTD. It explains how the questionnaire was designed, distributed and administered. There are also sections on the pilot study, on reliability and validity and on ethical approval.

5.2 Questionnaire Design

5.2.1 Introductory Paragraph

The questionnaire began with an introductory paragraph that provided information on the aims and objectives of the research, intended partly to convince participants of the importance of this research to them as well as to the researcher. Assurances were given on the use and confidentiality of the data and the introduction ended by stating how long it was expected that the questionnaire would take to complete Appendix 5.

5.2.2 Questionnaire Items

The questionnaire comprised 26 items in three sections, the first of which elicited participants' demographic characteristics through six closed-ended questions about their age, gender, country of origin, length of time studying or working at the university, academic

position and the school to which they belonged Appendix 5. This varied information helped to establish the different profiles of the people using KUTD services, so that they could be grouped in terms of their characteristics and their preferences in using particular tools or following a specific way to KUTD.

The first stage of questionnaire design was to set out the objectives of collecting data and the second stage was to draft the questions. To begin, an extensive list was made of what should be covered in the questionnaire, such as the main ideas and issues concerning the KUTD behaviour of staff and PhD students. Reviewing the literature provided a good overview of different topics related to KUTD, allowing different sections to be created, dealing with particular themes. Next, an attempt was made to compose questions covering the main theme of each section from different perspectives. Only the most relevant questions were included, based on the literature review and the conceptual framework. At the same time, the best response to each question was also considered. This was followed by checking the flow of questions through the questionnaire, from general to more specific, which would help participants to engage with the topic by inviting them to think about their own KUTD behaviour before answering the more detailed questions.

In terms of the writing style, careful consideration was given to each questionnaire item to make sure that the respondents could easily and fully understand it without needing any explanation. The questions were thus asked very clearly and directly, avoiding any complex style or format, so that every participant could answer them confidently and unhesitatingly. When the researcher felt the need to use any technical terms, these were clearly explained. It was also important to simplify the layout, to choose the right font size and to use bold format where needed to make it easy for participants to read (Brace, 2008).

In short, the researcher took every precaution to ensure that the questionnaire would be easily understood (Rea and Parker, 2014). This was verified by means of a pilot study, as discussed in (section 5.5).

Another important factor to be addressed in the present research was the maintenance of confidentiality so that respondents could freely report their feelings, opinions and experience. Thus, while email addresses were solicited if respondents chose to provide it for further contact, the use and analysis of the data was made anonymous by taking the following steps:

- Respondents were identified by an ID number rather than by name.

- Data could be viewed only by authorized persons, i.e. myself and the academic supervisor.
- Password-protected software was used to generate, store and analyse the data.

5.2.2.1. Section I: Demographics

The objective of the first section was to identify the main characteristics of the survey population but without revealing their identity. All of the items were closed-ended questions. For instance, in response to the first, “What is your age group?”, respondents were asked to select one of five age ranges. This question was included in order to investigate whether age had any effect on KUTD, such as using particular methods, or whether a given age group shared certain characteristics. Question 2 asked participants to select their gender, then the third question offered a list of countries from which participants were asked to select the one where they had obtained their most recent degree, in order to determine whether the previous study environment might affect KUTD practices.

Question 4 concerned the length of participants’ experience of their current environment by asking: “For how many years have you worked or studied at the University of Strathclyde?” Again, a number of ranges of years were available for selection. Question 5, on current status, asked participants to select one of seven academic positions ranging from PhD student to professor Appendix 5. The final question was originally about the departments in which the participants worked or studied, but the researcher realized that this might enable them to be identified, so the departments were instead grouped into four faculties from which participants were asked to select one. Overall, responses to items in this section were expected to provide a clear picture of the people who KUTD, use particular methods or follow a certain approach.

5.2.2.2. Section II: General Information about KUTD

The second section was related to the purpose of KUTD, its importance, participants’ ability and the difficulties that they might face. It began with general introductory information about KUTD, the aim of the section being to introduce the various aspects of KUTD gradually through clear, easily understandable questions, so that participants would find the questionnaire accessible and by the end of the third section would have a better understanding of KUTD.

Section II began with Question 7, “How important do you feel it is to keep up to date with the latest developments in your field?”, using a five-point scale from ‘not important’ to ‘very important’. The aim was to determine to what extent staff and PhD students believed KUTD behaviour to be important for them. Question 8 was a follow-up item seeking to improve understanding of staff and PhD students’ engagement with KUTD, by asking: “For which work-related tasks do you feel it is most crucial to keep up to date? Please choose as many options as you feel appropriate”. The options offered included teaching, researching, citizenship, knowledge exchange and administrative work; participants were also invited to write in tasks not listed if they considered them crucial.

In order to investigate whether staff and PhD students struggled to KUTD, Question 9 asked “How difficult do you feel it is to keep up to date in your field?”, using a five-point scale from ‘very difficult’ to ‘very easy’.

Questions 10 and 11 concerned attendance at training courses. Participants were first asked “Have you ever attended any training courses on keep-up-to-date services?” Those who selected ‘No’ were directed to Question 12, whereas for those who responded ‘Yes’, Question 11 offered two options for the type of course attended. These questions were designed to indicate whether participants needed help to KUTD.

Question 12 asked “How would you describe yourself in terms of your ability to use varied tools and methods to keep up to date with the latest developments in your field?” Participants were given three options to choose from: ‘beginner’, ‘competent’ and ‘expert’ Appendix 5. The aim was to discover how good participants thought they were at KUTD with the latest developments in their field.

Question 13 concerned the KUTD methods, discussed in more detail in the methodology chapter. This question considered all of the behaviours listed in Table 5 in the section on research techniques.

Question 14 was an open-ended follow-up item inviting participants to add any methods of KUTD not listed: “Are there any other ways in which you KUTD with the latest developments in your field?” A link between this question and other question was asked in the interviews to elicit more in-depth information about other KUTD methods and this is discussed in detail in Chapter 7.

Section II ended with Question 15: “Which of the following obstacles can affect your ability to KUTD? Please choose as many as you feel appropriate.” The four options included being

unaware of how to use KUTD services, having insufficient time to keep up to date and there being no obstacles. By identifying any barriers that might prevent participants from KUTD, the aim was to investigate ways to overcome them. Again, participants were given the option of adding any obstacles that were not listed. This question is discussed in detail in the interview analysis, as it provided in-depth information about other KUTD obstacles, in addition, most of the follow up open-ended questions will be discussed in more details with the related interview questions.

5.2.2.3 Section III: Library KUTD Services

The third section of the questionnaire focused mainly on the KUTD services provided by the University of Strathclyde library. As mentioned that, the previous chapter tends to understand the service provides (University library) perspective on KUTD by focusing on university library website and librarians, whereas in this section the focus on benefit owner (staff and PhD students). How they used the services and what do they think about the KUTD services that the library provided.

This section consists of 4 items were yes/no questions. Question 16 asked participants if they were aware of KUTD services provided by the library. If they answered ‘no’, skip logic took them straight to Question 22, since numbers 17 to 21 directly concerned the library’s KUTD services, representing the role of the university in keeping staff and PhD students up to date and helping to measure the level of engagement with the services provided. Questions 17, 18 and 19 asked participants if they had ever had help from the librarians in KUTD, whether they needed any help in using the library’s KUTD services and whether they had ever used those services.

To find out which of the library’s KUTD services were the most helpful to staff and PhD students, Question 20 asked participants to assess 4 services on a five-point scale from ‘very unhelpful’ to ‘very helpful’, with a sixth option of ‘not used’ for any services that they had never used. The 4 services were listed as follows:

- Setting up alert services
- Sending you lists of publications in your field
- Emailing you with new content in your field
- Talking to you about your information needs

Question 21 invited participants to indicate on a five-point scale the extent of their agreement or disagreement with 6 statements about their ability to use the library's KUTD services, again with a 'not used' option Appendix 5. The statements represented various categories of service management: the first two related to how the library delivered the services, the next two concerned service support and the last 2 were about engagement with the services.

Questions 20 and 21 were included in the questionnaire as a result of an analysis of the library website which raised some matters that were subsequently discussed in an interview with the librarian. The aim of these questions was to assess the management of KUTD services provided by the university library.

Question 22 was designed to provide an overview of participants' perceptions, their needs and what could help them to KUTD. They were asked what they thought was needed to improve their ability to KUTD, the options being training sessions on KUTD methods and services, tailored support from a librarian with expertise in KUTD, support in using specific KUTD methods such as alert services, or "None of the above". Question 23 simply asked participants if they would or would not attend a session to learn how to use KUTD services. Question 24 invited them to mention anything else about KUTD that they would like to add and enough space was provided for such comments. This question will be discussed in detail in Chapter 7 because there was a similar interview question designed to elicit more in-depth information about other KUTD methods.

As interviews with a volunteer sample of staff and PhD students were also to be used to collect data for this research, Question 25 asked whether participants would be interested in taking part in such a follow-up interview, in which case they were asked to supply an email address.

All the open ended questions which included question 8,14,15, and 24 will be discussed and analysed with the interviews findings Chapter 7.

5.2.3 Closing Statement

Item 26 thanked participants for taking part in the questionnaire and invited them to provide an email address if they wished to be entered into a prize draw to win a £20 Amazon voucher. There was then a final statement thanking participants again for their time Appendix 5, Figure 22 shows the structure of the questionnaire as a flow diagram.

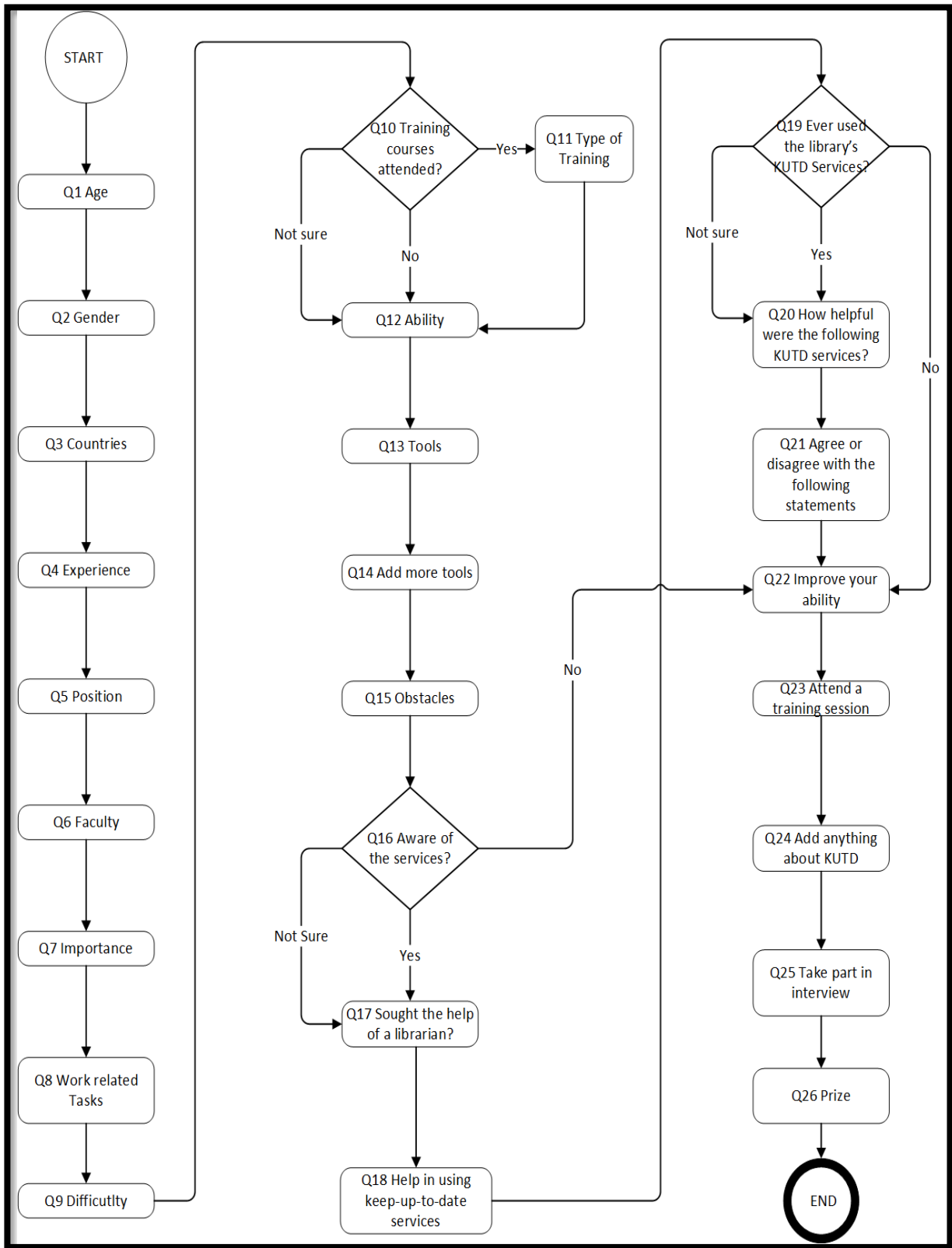


Figure 22: Questionnaire Flowchart

5.3 Pilot Study

Once the questionnaire had been designed, it was important to conduct a pilot study, whose main aim was to ensure the reliability and validity of the research instruments before distribution. Pilot studies can determine whether participants have been given the appropriate instructions to complete the questionnaire and can assess the flow of questions in general (Bryman, 2015).

One of the advantages of a pilot study is that it can show whether the research protocols have been followed and warn if the instruments are inappropriate or too complicated for participants (Van Teijlingen and Hundley, 2001). It provides a good opportunity for drafting and revising the questionnaire and improving the researcher's skills, thus enhancing consistency of measurement.

The present questionnaire was subjected to two stages of piloting before the final version was accepted. First, a draft of the questionnaire was distributed to a total of 10 PhD students in the department and some academic colleagues. The main aims of this stage were to check whether participants clearly understood the questions and instructions and to measure the time needed to complete the questionnaire. This initial pilot also helped to check the general structure of the instrument and the flow of the questions Appendix 9.

As most of the feedback was positive and no critical or important changes to the design or presentation were suggested, therefore it was necessary to repeat the pilot study among a group of people who are qualified but less familiar with topic to evaluate the questionnaire critically and to offer constructive criticism. At the suggestion of the researcher's supervisor, a Facebook research group was therefore convened, consisting of PhD students at other universities, a previous supervisor and some other professional people recruited through personal connections. A total of 24 responses were collected, 15 reviewers having completed the questionnaire before providing feedback, while the remaining 9 simply provided written feedback and comments Appendix 10. Most of the comments were again positive, indicating that the participants appreciated the clarity of the questionnaire in terms of design and structure. A number of suggestions for improving the questionnaire were also made, however, and all constructive comments were considered carefully while revising the questionnaire before distribution.

5.4 Reliability of the Piloted Version

The reliability of the piloted questionnaire was measured and assumed to reflect the reliability of the actual questionnaire. Reliability is defined as the stability of the measure, meaning the consistency of the instrument in measuring an attribute, variable or construct (LoBiondo-Wood and Haber, 2014). In the pilot study, reliability was tested by measuring internal consistency for all KUTD methods, using Cronbach's alpha, which was found to be 0.92 Table 32 in Appendix 11. As this exceeded the minimum value of 0.60, the pilot questionnaire was deemed to be of sufficient reliability.

5.5 Research Population

The population is the group of individuals from which the sample is taken to conduct the research (Singh, 2007). The target population in this case comprised the staff and PhD students in all disciplines in the 29 departments of four faculties at Strathclyde University, namely Engineering, Humanities and Social Science, Science and Business. According to the Human Resources Department of the University, there were 3205 staff members and PhD students in these four faculties at the time of the research.

Since very few responses were received from members of the Business faculty, it was decided to exclude it from the research population before any analysis was done. This left a total population of 2936 academic staff and PhD students in three faculties, which was deemed to ensure sufficient diversity of respondents within Strathclyde University for a meaningful analysis of the findings.

This population included people in all of the following academic positions: PhD student, research associate, research fellow, lecturer, senior lecturer, reader and professor. According to the UK academic ranking scale, the rank of lecturer consists of two levels: A and B. The following definitions are those of Strathclyde University (2017):

Lecturer A is ranked at grade 7. A candidate should have knowledge and skills that are associated with the first degree, as well as a PhD or other professional qualification and at least four years' experience.

Lecturer B is ranked at grade 8. A candidate should have a PhD, knowledge and skills that are associated with the first degree and seven years of professional experience which reflects independent teaching, research and student support.

Senior lecturer is ranked at grade 9. A candidate should have a professional qualification, a sustained record of teaching and researching in their field and a high level of professional experience.

Reader is ranked at grade 10. A candidate should have an excellent reputation on the national level and working experience at the international level with evidence of excellent reports from experts showing contributions in both teaching and research.

Professor. A candidate should have outstanding professional experience, an international reputation in their field and a sustained teaching and research career.

Research associate is ranked at grade 7. A candidate should have knowledge and skills that are associated with their first degree, a PhD and at least four years of professional experience.

Research fellow is ranked at grade 8. A candidate should have a PhD, research experience, the ability to deliver and disseminate independent research and seven years of professional experience.

5.6 Questionnaire Sample

A sample is a subset of a research population, selected to permit the generalization of a particular phenomenon from the sample (Saunders, 2012). Hence, the sample should truly reflect the characteristics of the whole population (Hardon et al., 2004; Saunders, 2012). It is very important to carefully select the sample, because sampling can have a significant impact on the final outcome of a study and determine whether the research questions are reliably answered. The challenge is to find a representative sample of manageable size, which is very important to save time, reduce costs and facilitate the organizing and analysis of the data. A smaller dataset can be fully analysed in detail by allowing a good amount of time to be spent on its design, organization and piloting (Barnett, 2002). At the same time, it can help to reduce errors and obtain more accurate results by avoiding the discrepancies of a larger population (Creswell, 2002).

The current research population, as explained above, was the staff and PhD students of 3 faculties of Strathclyde University. The final sample was the 207 people who responded to the questionnaire. The findings can be implemented within the university and may be generalized to other Scottish universities because of similarities in culture and geographical

location. Therefore, the research assumes that academics' KUTD practices are similar among Scottish universities. Further investigation is needed to compare different geographical locations such as England and Scotland or Saudi Arabia and the UK, to understand more about KUTD practices. Overall, human nature keeps changing and no research can be generalized in general, but further investigation can check if what was found in Strathclyde University can be applied in other universities or in similar geographic location.

The research was limited in scope to the behaviour of staff and PhD students at Strathclyde University and relied on a sample covering all academic disciplines. However, it purposefully excluded undergraduates and master's degree students because they would mainly be building basic knowledge in their fields and not likely to be engaged in research, meaning that they would not need to KUTD with detailed developments.

Academics and researchers were chosen for various reasons, including their roles in the creation and dissemination of information as well as the transfer of knowledge, both inside and outside the academic community. PhD students were chosen because they are both graduate students and young researchers at the same time (Spezi, 2016). Including staff and PhD students in the case study would generate insights about KUTD from both students' and researchers' perspectives. There are some important differences between students and staff. PhD students usually conduct research in a specific area; although their research domain may evolve substantially, passing through several stages of change, their focus on a specific topic can limit their awareness of different research areas that may be related to their professional future (Tenopir et al., 2016). Senior academics differ in being engaged in multiple research areas (Horlings and Gurney, 2013), but both groups need to KUTD in their fields.

The researcher has assumed that the total population of 2936 received the online questionnaire. At the same time, it was beyond the researchers' control to avoid the phenomenon of non-response for reasons such as shortage of time or any other personal factor leading potential participants not to submit a response (Gobo, 2004). Since participation was completely voluntary, some level of non-response was inevitable. In order to increase the response rate (Section 6.10) and ensure that the questionnaire was distributed to the whole target population, the researcher sought help from the Vice Deans, Heads of Department and the University's Research and Development Programme (RDP), as discussed in the following section.

5.7 Questionnaire Distribution

The questionnaire was distributed in two stages in order to promote participation among each target group. To maximize the motivation of staff members to take part, it was decided to recruit the assistance of influential people such as Vice Deans and Heads of Department. Therefore, the researcher's supervisor first contacted the Vice Deans, asking them to assist the researcher in distributing the questionnaire to staff via a web link in an email containing a friendly invitation to take part in the questionnaire Appendix 6. It included some information on the purpose of the research and how it might benefit them; an information sheet was attached to the email for any potential participants who might want to know more about the research Appendix 7. A total of 4 emails were sent to the Vice-Deans of the Strathclyde Business School and the Faculties of HASS, Engineering and Science.

The second stage involved seeking the help of the University's RDP in distributing the questionnaire to PhD students across the university. The RDP is a development body which focuses on creating a high-quality research environment by supporting collaborative working and development skills. Again, the researcher's supervisor sent an email to the RDP asking for help in distributing the questionnaire. The RDP agreed to do so and asked the researcher to write a 150-word promotional text to be included in GradNews, an e-newsletter informing students about development courses and opportunities across the University. There were three versions of this advert, to ensure that it was interesting enough to attract the attention of students, who were encouraged to take part by the offer of a £20 voucher Appendix 8. The advert was submitted on 1 November 2016 and stated that the questionnaire would be made available until the end of that month, which means that it was accessible to participants around two months.

5.8 Questionnaire Response Rate

The response rate is of crucial importance for a research survey. It is calculated by dividing the number of people who return the questionnaire by the total number of people to whom the questionnaire was distributed, then multiplying by 100 to obtain a percentage (Morton et al., 2012). Using a questionnaire as a research instrument can only ensure full knowledge of the population if all of its members answer the questionnaire, giving a 100% response rate. However, this is over-ambitious as it is beyond the researcher's control and depends on the behaviour of that population. The acceptable response rate varies according to the research

discipline and mode of data collection (Burkell, 2003; Baruch and Holtom, 2008; Couper and Triplett, 1999; Hemminger et al., 2007; Schonlau et al., 2002; Couper, 2000).

As noted above, the present questionnaire was distributed to 2936 members of the Engineering, Science and HASS faculties of the University of Strathclyde. After eliminating the Business Faculty, from which only 9 responses were received, a total of 207 members of staff and PhD students responded, a response rate of 7.05%.

Several factors may have depressed the response rate in the present research. Firstly, the target population of staff and PhD students were very busy, so the researcher sought to avoid putting undue pressure on them. People in high professional positions tend to respond less (Baruch, 2000); therefore, potential participants were not asked more than once to respond, since those who did not or could not respond the first time would be unlikely to change their minds, regardless of how many times they were reminded about the questionnaire.

Secondly, the email linked to an online questionnaire can be blocked or treated as spam (Couper et al., 2007). The present researcher found that some potential respondents in their department did not receive the questionnaire because their contact information had not been updated for technical reasons, so it had to be resent. A low response rate, including a failure to give complete responses, may also occur among a specific subset of the population; since this research sought the participation of staff and PhD students across four faculties, there may have been some imbalance in responses among demographic groups.

Response rate can be improved by considering factors such as the research name, the length of the online questionnaire (Cook et al., 2000), user-friendly design and the time of its release (Saunders et al., 2012). In the present research, several approaches were adopted to increase the response rate. Firstly, the email was drafted to grab the attention of readers and entice them to participate by clearly stating the research objectives and emphasising that participation would help to improve KUTD practices and to design better training. The release date of the questionnaire, 13 October 2016, was carefully chosen as a less busy time, when most students and staff would have already settled into the term. Thirdly, to give participants sufficient time to complete the questionnaire, it was made available until the end of November 2016. Importantly, participants were offered the chance to win a £20 Amazon voucher, since financial incentives can increase response rates more than twofold (Edwards et al., 2002; Göritz, 2006). In order to save participants' time and thus further increase the response rate (Handwerk et al., 2000), the questionnaire focused on a small set of sub-topics

such as different KUTD methods, potential obstacles and KUTD services at Strathclyde University. This made it possible to state on the first page that only ten minutes would be needed to complete the questionnaire, although more time might be needed if participants chose to supply additional information in response to the open-ended questions. Finally, the questionnaire was distributed by trusted figures at Strathclyde University, as detailed in (Section 5.9).

Although 7% is not a very high response rate for a survey, the literature indicates that it can be considered acceptable for such a research, for several reasons. Firstly, larger organizations such as universities are likely to generate low responses to surveys (Cotton and Wonder, 1982). Secondly, mail and e-mail delivery tend to result in lower response rates than personal contact (Wathen and Burkell, 2002).

5.9 Reliability and Validity

Research methods and data gathering instruments including questionnaires must meet two important tests of adequacy, which are reliability and validity. Reliability represents the consistency of the measurement and the likelihood of obtaining the same results if a test is repeated (Bhattacharjee, 2012). In other words, if anyone conducts the same research again using the same data collection methods, the same results should be obtained, which indicates the stability of the process (Walliman, 2015).

Reliability tends to be associated with quantitative research as a measure of confidence in the consistency and stability of the research data. There are three type of reliability: test-retest, multiple forms and internal consistency (Bryman and Bell, 2011). In view of the time constraints involved in retesting the questionnaire, this research used internal consistency as a measure of reliability, expressed in terms of the Cronbach's alpha coefficient. Table 33 Appendix 11 shows that the overall value of Cronbach's alpha for the questionnaire was 0.83, signifying good reliability.

As to validity, this measures the extent to which the research outcomes are true (Seale and Filmer, 1998; Field, 2009). In other words, it measures the degree to which the research concept measures the parameters it was designed for (Neuman, 2013). In this research, as the phenomenon of interest is KUTD, validity would measure how accurately KUTD behaviour is measured by the research. A measure of internal validity in the present research can be made by having pilot studies and assessing the consistency of the questionnaire results with

the results of the interviews and the extent to which these together meet the declared aim and objectives.

The literature states that validity helps to determine whether the data collected are a product of the research methods rather than the phenomenon being studied (McNeill and Chapman, 2005).

5.10 Ethical Approval

An essential component of good research practice is ethics (Pickard, 2013). All research which involves human participation requires ethical checks (McNeill and Chapman, 2005). In order to obtain ethical approval, the Departmental Ethics Committee was contacted and an information sheet and consent form was provided. The Committee duly granted ethical approval for both the questionnaire and the interviews.

5.11 Summary

This chapter has provided detailed information on one of the research methods used to collect data, the questionnaire, considering its design and the type of questions asked, the questionnaire content and the reasons for including specific questions. Subsequent sections discussed the pilot study, the research population and sampling, questionnaire distribution and response rate, the reliability and validity of the instrument and finally, ethical approval.

Chapter 6: Research Analysis

6.1 Introduction

This chapter focuses on both descriptive and inferential analyses. The present research used a questionnaire to collect data on a number of variables that might affect KUTD, such as age, educational background and position. In order to understand and compare the KUTD behaviour of staff and PhD students, data on their various traits were grouped according to age, academic position, level of seniority, experience, faculty and gender.

This chapter reports several statistical procedures that were adopted to describe the data. Descriptive analyses were performed to produce information about the sample distribution and response rate for each question, thus providing a clear idea of the size of the dataset. A normality test was conducted to check the distribution of the data, which could then help in deciding between parametric and non-parametric tests. Factor analysis (FA) was also, used to reduce the number of KUTD methods to a manageable size. These analytical techniques helped the researcher to determine all relevant characteristics of the data and to identify any potential patterns emerging from the dataset.

The chapter also focuses reports the use inferential statistics to draw out the main findings of the questionnaire survey by answering a number of questions, such as whether there were any significant differences in the use of KUTD methods associated with age, gender, length of experience, position, faculty, importance, and difficulty. Answering these questions required a comparative analysis between different variable groups, more details about it will be discussed under inferential analysis section.

6.2 Demographic Data

Tables 8 and 9 show the distribution by gender and by academic position of the research population and sample in the Science, Engineering and HASS faculties at Strathclyde University, while Table 10 shows the distribution of the sample by the three major variables of gender, age and faculty. Table 9 reveals that a little under half of the sample (47%) were

PhD students, while more than half comprised academic staff, predominantly research associates (22%) and lecturers or senior lecturers (19%).

As to gender, it is clear from Table 8 that two-thirds of the research population was male and that the two genders were somewhat more equally distributed in the sample, of whom 40% were female.

Also, the highest response rate (7.7%) came from the Faculty of Engineering. The sample comprised a total of 207 respondents from a population of 2963, giving a response rate of 7% Table 36 Appendix 12.

Gender	Population	Sample
Male	1952 (66.5%)	121 (58%)
Female	984 (33.5%)	84 (40%)

Table 8: Gender in the Population and Sample

The final column of Table 9 indicates that the response rate among research fellows was the same as for the population and sample as a whole, while research associates, lecturers and readers, with response rates of 12%, 15% and 13% respectively, were proportionally more strongly represented in the sample. PhD students, despite being by far the largest group in number, had the lowest response rate (5%).

Position	Population N=2963	Sample N=207	Responses per position
Professor	234 (8%)	14 (6.8%)	6.0%
Reader	60 (2%)	8.0 (3.9%)	13%
Senior Lecturer	167 (6%)	13 (6.3%)	8.0%
Lecturer	174 (6%)	26 (12.6%)	15%
Research fellow	55 (2%)	4.0 (1.9%)	7.0%
Research associate	372 (13%)	45 (21.7%)	12%
PhD	1874 (63%)	96 (46.6%)	5.0%
Total	100%	99.8%	66%

Table 9: Academic Positions in the Population and Sample

Gender	Age (years)					Faculty		
	21-30	31-40	41-50	51-60	>60	Engineering	Humanities	Sciences
All in Percentage								
Male	65.2%	52.3%	60.0%	47.8%	60%	67.9%	38.1%	55.9%
Female	33.7%	46.2%	40.0%	52.2%	40%	31.1%	61.9%	42.4%
Prefer not to say	1.10%	1.50%	0.00	0.00	0.0	0.90	0.00	1.70%

Table 10: Distribution of the Sample by Gender, Age and Faculty (%)

In terms of the distribution of gender between faculties in the sample, males are seen to dominate in both Engineering (two-thirds) and Science (over half of respondents), whereas more than 60% of HASS respondents were female Table 10.

Table 11 lists the distribution of the sample by the country where participants had gained their most recently awarded degree, grouped by region. The UK is listed separately from other European countries because, unsurprisingly, it accounted for almost three-quarters of respondents. Of the other 24 countries represented, each had only one or two participants, with five exceptions: Spain (3), Italy (5), USA (6), China (7) and Australia (8).

Category	Country	Frequency	Percentage %
Arab countries	Iraq	2	1.0%
	Libya	1	0.5%
	Saudi Arabia	1	0.5%
	United Arab Emirates	2	1.0%
Asia	China	7	3.4%
	Hong Kong	1	0.5%
	India	2	1.0%
	Russian Federation	1	0.5%
	Turkey	1	0.5%
Australia		8	3.9%
Europe	Denmark	1	0.5%
	Czech Republic	1	0.5%
	France	4	1.9%
	Greece	1	0.5%
	Italy	5	2.4%
	Poland	2	1.0%
	Portugal	1	0.5%
	Slovakia	1	0.5%
	Spain	3	1.4%
	Sweden	1	0.5%
	Ukraine	1	0.5%
North America	Mexico	1	0.5%
	USA	6	2.9%
South America	Brazil	1	0.5%
UK		152	73.4%
Total		207	100%

Table 11: Distribution by Countries

Distribution of the sample by age, gender, experience, position and faculty is given in Table 12. This shows a distribution slanted towards younger people, as would be expected given the preponderance, noted above, of PhD students and research associates. The 21-30 age group accounted for 43% of the sample, while almost a third were aged 31-40 years and only a quarter were over 40. As to experience, this can be seen to be unevenly distributed, with almost 40% of participants having ten years or more and a third having close to five years of experience. Finally, more than half of participants were from the Engineering faculty, almost 30% from Science and only a fifth from HASS.

Demographic Distribution	Frequency	Percentage %
Age (years)		
21-30	89	43.0%
31-40	65	31.4%
41-50	20	9.70%
51-60	23	11.1%
>60 years	10	4.80%
Total	207	100%
Gender		
Male	121	58.5%
Female	84	40.6%
Prefer not to say	2	1.00%
Total	207	100%
Experience (years)		
< 1	28	13.5%
4 to <6	68	32.9%
6 to <10	31	15.0%
≥10	80	38.6%
Total	207	100%
Position		
Professor	14	6.80%
Reader	8	3.90%
Senior lecturer	13	6.30%
Lecturer	26	12.6%
Research fellow	4	1.90%
Research associate	45	21.7%
PhD student	96	46.4%
Total	206	99.0%
Faculty		
Engineering	106	51.2%
Humanities and Social Science	42	20.3%
Science	59	28.5%
Total	207	100%

Table 12: Demographic Distribution of Respondents (N=207)

6.3 General Information on KUTD

The second section of the questionnaire elicited general information about KUTD, including items on the importance of keeping up to date, the different tasks involved in KUTD, difficulties in KUTD, attending courses on KUTD, participants' ability to KUTD and finally, different KUTD methods.

There was near unanimity on KUTD being very important (68%) or important (30.4%) Table 44 Appendix 12. It can be seen from Table 44 Appendix 12 that almost all respondents considered it important to KUTD for research reasons, about two-thirds thought it was important for knowledge exchange and exactly half for teaching purposes. Twice as many respondents (34%) considered KUTD difficult as those who thought it to be easy (16%), while for the largest number (44%) it was neither difficult nor easy Table 46 Appendix 12.

Three-quarters of participants had attended no KUTD training sessions, yet only 9% were willing to attend training on the library's KUTD services and 14% other online courses Tables 47 and 48 Appendix 12. These results are broadly in harmony with those in Table 49 Appendix 12, showing that 70% of respondents assessed their existing ability to KUTD as 'competent' or 'expert', but they are not entirely consistent with the fact that Table 46 Appendix 12 shows 38% of the sample as considering KUTD to be difficult or very difficult.

Table 50 Appendix 12 lists the individual methods of keeping up to date under nine categories and reports the numbers and percentages of participants who stated that they never, rarely, sometimes, often or very often used each one. The most notable results under each heading are as follows.

Academic Tools: More than half of staff and PhD students often (29%) or very often (25%) used databases and bibliographies, whereas for both academic sharing websites and professional associations, only about a third often or very often used them and an equal number did so sometimes.

Academic Journals: Scanning online TOCs was reportedly quite common, with three-quarters doing so at least sometimes, but almost half rarely (16%) or never (30%) set up alert services.

People and Events: For each of the three methods in this category (attending events, scanning lists of papers and asking colleagues), the most frequent response was 'sometimes'

(36%, 34% and 41% respectively) and in all cases the next most frequent was 'often', with negative responses ('rarely' and 'never') together accounting for only 13%, 25% and 16%.

Library Services: Responses regarding the use of all library services were predominantly negative. Almost four-fifths of participants had rarely or never asked the library staff for help in KUTD, more than two-thirds had rarely or never scanned the library shelves and half had rarely or never even visited the library or its website. This means that interaction of staff and PhD students with library services was clearly limited.

Social Media: Responses to items in the social media category were also rather negative or at most neutral. Close to three-quarters of respondents rarely or never posted questions on social networks and these two responses together scored more highly than 'often' and 'very often' combined for each of the three other questions under this heading. The strongest neutral or positive response was that of the 32% who stated that they would sometimes follow the latest research conducted by research groups.

Alert Services: Again, there was a negative tendency in response to questions on alert services. More than half of participants rarely or never used these to be notified of new papers and almost half gave these negative responses regarding alerts and feeds for databases.

Citation Services: Items on citations services elicited somewhat more positive responses. Two-thirds of respondents often or very often followed references in a paper, while 70% sometimes or more often followed authors who cited interesting papers. A quarter used the 'cited by' function of Google Scholar and 39% did so often or very often. On the other hand, almost half rarely or never used specialised applications to import all cited papers.

Multimedia: Over half (56%) of the sample admitted to rarely or never listening to audio clips, while such negative responses accounted for 41% of replies to each of the other questions in this category and less than 30% of respondents often or very often looked at technical diagrams or watched video clips.

Other Sources: There was a sharp contrast between the two items in the final category. Three-quarters of the sample said that they often or very often used search engines, against fewer than 5% who rarely or never did so, whereas almost 60% rarely or never scanned Amazon for new books.

Response rates to the questions about KUTD methods were high, the lowest being over 90%. The five methods with the lowest response rates were 'ask library staff,' 'set up alert services

to notify me of new papers’, ‘set up alert services and feeds for academic databases’, ‘look at technical diagrams’ and ‘watch videos clips’.

Finally in this section, Table 51 Appendix 12 shows that the main obstacle to KUTD was lack of time, which two-thirds of respondents said affected them.

6.4 Library KUTD Services

6.4.1 “Yes” and “No” Questions

In the section on library services there was a logic skip in Q16 and Q19; therefore the response were limited to some extent. Table 52 Appendix 12 shows that in response to Q16 (Are you aware of the services provided by the university library to help you to keep up to date?), half of the participants responded negatively. Of those who responded ‘Yes’ to Q16, 42% responded negatively to Q17 (Have you ever sought the help of a librarian to keep up to date?). When asked in Q18 if they would like some help in using the library’s KUTD services, less than a quarter of participants responded ‘Yes’. In response to Q19 (Have you ever used the library’s keep-up-to-date services?), ten times as many replied ‘No’ as the number (only nine individuals) who said ‘Yes’.

6.4.2 Helpfulness of KUTD Services

This next section asked about the perceived helpfulness of four types of KUTD service: “Set up keep-up-to-date services via the library website”, “List of publications in your field”, “New content” and “Information need”. To all four, the strongest response was ‘Not used’, accounting for around 20% of participants in each case, and the next largest response was the approximately 5% who selected ‘helpful’ Table 53 Appendix 12.

6.4.3 Statements about KUTD Services

The final section on the library services included six statements to which participants were asked to indicate their degree of agreement or disagreement, or to state that they did not use the service. As Table 54 Appendix 12 shows, the responses to all six items were again dominated by the ‘Not used’ option.

Overall, it is clear that a large proportion of staff and PhD students rarely if ever used the library, which means that most participants did not interact with its KUTD services.

6.5 Options for Improving KUTD Services

When participants were offered three suggestions of ways that services might be improved to enhance their ability to KUTD, Table 55 Appendix 12 shows that only a quarter responded positively to the option of tailored support from a librarian, while over 40% agreed that training sessions should be offered on KUTD tools and services and that support in using specific methods would be useful. Consistent with these responses, 44% of respondents indicated that they were willing to attend training sessions.

These results reveal that staff and PhD students needed training on KUTD and that they were willing to attend such sessions if provided.

6.6 Normality Test

A normality test was conducted to determine whether the data had been drawn from a normally distributed population (Field, 2009). The results of this Shapiro-Wilk test showed that the data were not normally distributed Appendix 13.

6.7 Factor Analysis (FA)

Participants' behaviour, perceptions and attitudes with regard to the different methods of KUTD were measured by various questionnaire items. Factor analysis was applied to the responses in order to establish whether and how these methods should be grouped together.

FA is a statistical data-reduction technique enabling researchers to discover the dominant patterns in a dataset that could reflect the true properties of the data by grouping similar factors together (Hinton, 2004). The primary purpose of using it in this research was to identify the underlying dimensional structure, if any, of a set of measures (Yong and Pearce, 2013). Moreover, it would help in understanding the structure of a set of variables by reducing the different KUTD methods to a manageable size while retaining as much of the original information as possible. As a result, the extracted factors would represent all of the variables in the questionnaire, which could then be used in any later analysis (Bryman, 2008).

There are two types of factor analysis, namely principal component analysis (PCA) and principal factor analysis (PFA). PCA is the standard method of extraction and can be defined as a technique for obtaining a single factor by combining two or more correlated variables (Colman and Pulford, 2011). The first extracted factor explains the maximum variance and the following factors explain lesser portions of variance. Hence, the highly correlated items are identified and grouped together into a single factor, which in turn minimizes redundancy in the data (Bryman and Cramer, 2011) (Field, 2009). PCA is generally preferred when using factor analysis in causal modelling (Reimann, 2008).

As to PFA, it is very similar to PCA, the main difference being in the interpretation. For instance, PFA is interpreted in terms of the principal axis that detects the latent constructs behind the observations, whereas PCA identifies comparable groups of variables. The literature on FA emphasizes that these two techniques will tend to yield similar results when conducted with 30 items or more (Stevens, 2012).

In order to reduce the dataset to a manageable size, PFA was first used on the 26 items to eliminate any ineffective factors. PCA was then conducted to build a model by depending on the similarity and differences between the factors to cluster the different methods and to confirm the PFA results. The results of both types of FA showed that four components influenced the use of KUTD methods:

1. **Social Media (SM):** The first component is a combination of four important factors that can be considered in future design: posting questions on social networks; using social media websites to follow certain academics or authors; following the latest research conducted by research groups; and following the latest research conducted by significant independent researchers in my field.
2. **Alert Services (AS):** The second component is a combination of three influencing factors: scanning online TOCs of journals in my field; setting up alert services to notify me of new papers; and using alert services and feeds for academic databases.
3. **People and Events (PE):** The third component is a combination of two influencing factors: attending events and scanning lists of papers in conferences.
4. **Library Services (LS):** The fourth component is a combination of three influencing factors: asking the library staff; visit the library or its website; and scanning the library shelves Table 13 PFA

Other than the above four components, there were differences or reductions in the PFA and PCA results Table 14 PCA in having the same statistical results from both types, meaning that the model of components is reliable Appendix 14.

The Kaiser-Meyer-Olkin (KMO) measure was used to verify the sampling adequacy of the analysis. A KMO value of 0.5 “is poor; 0.6 is acceptable; a value closer to 1 is better” (Plonsky, 2015). In this case, KMO = .742, showing sampling adequacy to be acceptable. The result of Bartlett’s test of sphericity was $\chi^2_{(325)} = 1884.479$, $p < .000$, which means that the factors were acceptable and reliable (Brace et al., 2003) Table 15.

Rotated Factor Matrix^a

	Factor						
	1	2	3	4	5	6	7
AT databases or bibliographies							0.502
AT sharing websites					0.340		0.570
AT professional associations			0.445				
AJ online table of contents			0.390				
AJ alert services		0.756					
PE attend different events			0.747				
PE lists of papers in conferences			0.672			0.313	
PE ask my colleagues			0.452				
LS ask the library staff				0.600			
LS visit the library or its website				0.802			
LS scan the library shelves				0.753			
SM post questions on social networks	0.662						
SM follow certain academics or authors	0.791						
SM follow the latest research conducted by research groups	0.852						
SM follow the latest research conducted by significant independent researchers in my field	0.666						
AS set up alert services to notify me of new papers		0.886					
AS feeds for academic journals or databases		0.963					
CS cse 'cited by' in Google Scholar						0.375	
CS use specialised applications to import all cited papers					0.400	0.306	
CS follow references cited in an interesting paper						0.823	
CS follow authors who cited interesting papers						0.600	
MM look at technical diagrams					0.525		
MM watch video clips					0.771		
MM listen to audio clips			0.313		0.486		
OS search engine websites						0.358	
OS scan Amazon for new books							

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

Table 13: Rotated Factor Analysis

Rotated Component Matrix^a

	Component						
	1	2	3	4	5	6	7
AT databases or bibliographies							0.703
AT sharing websites					0.485		0.580
AT professional associations			0.545				
AJ online table of contents			0.416				0.482
AJ alert services		0.838					
PE attend different events			0.812				
PE lists of papers in conferences			0.714			0.346	
PE ask my colleagues			0.590				
LS ask the library staff		0.337		0.673			
LS visit the library or its website				0.855			
LS scan the library shelves				0.836			
SM post questions on social networks	0.751						
SM follow certain academics or authors	0.843						
SM follow the latest research conducted by research groups	0.862						
SM follow the latest research conducted by significant independent researchers in my field	0.730						
AS set up alert services to notify me of new papers		0.914					
AS feeds for academic journals or databases		0.933					
CS cse 'cited by' in Google Scholar				-0.307		0.479	
CS use specialised applications to import all cited papers					0.548	0.349	
CS follow references cited in an interesting paper						0.795	
CS follow authors who cited interesting papers						0.686	
MM look at technical diagrams					0.697		
MM watch video clips					0.749		
MM listen to audio clips			0.370		0.555		
OS search engine websites						0.610	
OS scan Amazon for new books				0.330			

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

Table 14: Rotated Principle Component

The Kaiser-Meyer-Olkin (KMO) measure was used to verify the sampling adequacy of the analysis. A KMO value of 0.5 “is poor; 0.6 is acceptable; a value closer to 1 is better” (Plonsky, 2015). In this case, KMO = .742, showing sampling adequacy to be acceptable. The result of Bartlett’s test of sphericity was $\chi^2_{(325)} = 1884.479$, $p < .000$, which means that the factors were acceptable and reliable (Brace et al., 2003) Table15.

Kaiser-Meyer-Olkin measure of sampling adequacy.	0.742
Bartlett's test of sphericity	Approx. chi-squared
	1884.879
	df
	325
	Sig.
	0.00

Table 15: KMO and Bartlett's Test

6.7.1 Reliability Test of the FA

In order to assess the reliability of the FA, a total of only 12 items were tested, because these were found to be the most influential factors. Cronbach’s alpha coefficient was used to measure the consistency of the FA. The result, $\alpha = 0.78$, indicates acceptable reliability Table 16.

Cronbach's alpha	Cronbach's alpha based on standardized items	N of items
0.782	0.780	12

Table 16: Factor Analysis Reliability

The demographic data reveal that the sample contained more males than females, that respondents tended to be young, almost half being PhD students, and that more than half were in the Faculty of Engineering. Participants were predominantly from the UK and varied in their length of experience. Their most common reason for KUTD was conducting research and lack of time was among the challenges facing them in doing so. In general, however, respondents felt that it was not difficult to KUTD with the latest development in their fields

and that it was very important to do this. Academic staff and PhD students appeared to have little interaction with the library and its KUTD services, but many were willing to attend training courses to learn how to use KUTD tools and services.

Overall this chapter provide the general information about participants' KUTD behaviour and identified some of methods that have been used in order to KUTD. However, more in-depth information is needed about KUTD methods and which of these methods are most used. In addition to that, identify which demographic groups tend to use these methods, as it will be discussed in the following section.

6.8 Inferential Statistics

This section focuses on whether there were any significant differences in the use of KUTD methods associated with age, gender, length of experience, position, faculty, importance, difficulty and academic ability. For example, participants were divided into five groups by age and two by gender, while there were different numbers of groups for each of the other variables. In order to compare them, two different tests were used: the Mann-Whitney U test to compare two groups and the Kruskal-Wallis tests to compare three or more groups. The following sections discuss each variable in detail to answer these questions:

Q1 Was there any age difference in the use of KUTD methods?

Q2 Was there any gender difference in the use of KUTD methods?

Q3 Was there any difference of length of experience in the use of KUTD methods?

Q4 Was there any difference of position in the use of KUTD methods?

Q5 Was there any difference of faculty membership in the use of KUTD methods?

Q6 Was there any difference of perceived importance of KUTD in the use of KUTD methods?

Q7 Was there any difference of perceived difficulty in the use of different KUTD methods?

Q8 Was there any difference of academics' perceived ability in the use of KUTD methods?

Another focus of the analysis reported in this chapter was on identifying tasks that academics most often cited as their reasons for KUTD. Research was identified as the activity for which the largest number of participants perceived a need to KUTD (Section 6.3 General Information on KUTD).

The analysis also answered questions about who had attended different KUTD courses in the past, the types of obstacles they had faced in KUTD and their use of university library services. Answering such questions can help in understanding more about participants' KUTD behaviour.

With regard to training, the analysis focused on the types of sessions that participants had attended in the past and whether they were willing to attend future sessions on KUTD. This involved addressing the following questions:

Q9 What types of training sessions did staff and PhD students attend in the past and would they like to attend future sessions to learn about KUTD?

Q10 Were there any differences of age, gender, faculty or position in attendance at training sessions on the university library's KUTD services?

Q11 Were there any differences of age, gender, faculty or position in attendance at other online courses?

Q12 Were there any differences of age, gender, faculty or position in participants' willingness to attend training sessions to learn how to use KUTD services and tools?

In terms of obstacles to KUTD, the focus was on identifying the types of obstacles and who faced them. Therefore, the analysis had to answer these questions:

Q13 Were there any differences of age, gender, faculty or position in perceiving lack of awareness of KUTD services as an obstacle?

Q14 Were there any differences of age, gender, faculty or position in perceiving lack of time as an obstacle?

Q15 Were there any differences of age, gender, faculty or position in perceiving there to be no obstacles?

With regard to the section on library services, the analysis sought to determine which of the library's KUTD services had been used and by whom. Finally, analysis of the various options to improve KUTD focused on which of these were considered to be most appropriate and by whom. This required the following questions to be addressed:

Q16 Were there any differences of age, gender, faculty or position in the use of different library KUTD services?

Q17 Were there any differences of age, gender, faculty or position in the choice of options to improve KUTD ability?

The following sections report all significant findings, i.e. where the statistical tests that were applied to the questionnaire data identified significant differences between groups in their use of KUTD methods, attendance at courses or perceptions, whereas insignificant results are not reported in detail. The following sections report differences in methods used by gender, age, experience, position, faculty, perceived importance and perceived difficulty respectively.

6.8.1 Gender Differences in Methods Used

The Mann-Whitney U test was used to check for gender differences in KUTD methods used by comparing the usage of males with that of females. The procedure, which also applies to all other variables referred to in this chapter where two groups were compared, was as follows. First, the p-value was determined, any value less than 0.05 indicating a significant difference. Next, the mean rank was calculated. The rank refers to the data transformation where numerical or ordinal values are placed into a rank order when the data are sorted, while the mean is the average value that is used to derive the central tendency of the data. In the case of gender, the higher mean rank value determines which of the two gender groups used a particular method more than the other group.

The test produced evidence of a significant difference ($p < 0.05$) between the mean ranks of the two groups for 6 of the 26 methods, each in a different category, namely “Professional associations”, “Alert services”, “Visit the library or its website”, “Set up feeds for academic databases”, “Look at technical diagrams” and “Search engines” Table 17. All significant gender differences are detailed below.

	Methods	U value	P value	Mean rank	
				Male	Female
AT	Databases or bibliographies	4242.0	0.81	95.78	93.88
	Sharing websites	4015.5	0.38	92.18	99.02
	Professional associations	3493.50	0.02	87.26	104.7
AJ	Online table of contents	3812.0	0.19	90.34	100.5
	Alert services	3544.50	0.04	87.93	103.9
PE	Attend different events	4008.5	0.36	92.11	99.11
	Scan list of conference papers	4177.0	0.75	95.53	93.05
	Ask my colleagues	4134.0	0.65	95.92	92.50
LS	Ask the library staff	4001.0	0.52	91.71	96.04
	Visit the library or its website	3395.0	0.01	86.59	106.9
	Scan the library shelves	4060.5	0.43	92.58	98.44
SM	Post questions on social networks	3997.0	0.39	92.01	98.09
	Follow certain academics or authors	3957.5	0.37	91.65	98.60
	Follow the latest research conducted by research groups	4094.5	0.72	92.89	95.63
	Follow the latest research conducted by significant independent researchers in my field	3952.0	0.37	97.40	90.32
AS	Set up alert services to notify me of new papers	3537.0	0.06	87.45	102.1
	Set up feeds for academic databases	3433.5	0.03	86.50	103.4
CS	Cited by Google Scholar	3683.0	0.09	100.0	86.72
	Use specialised applications to import all cited papers	3649.0	0.06	101.1	86.28
	Follow references cited in an interesting paper	4241.5	0.80	94.21	96.12
	Follow authors who cited interesting papers	4068.5	0.47	97.35	91.66
MM	Look at technical diagrams	3189.5	0.01	101.5	80.53
	Watch video clips	4155.5	0.63	96.56	92.78
	Listen to audio clips	3887.0	0.21	91.02	100.7
OS	Search engine websites	3427.5	0.01	103.1	83.44
	Scan Amazon for new books	3682.0	0.07	100.8	86.71

Table 17: Gender and KUTD Methods

Academic Tools (AT)

A highly significant gender difference was found for the “Professional association” method, which females ranked more highly than males (U =3493.5, n1=110, n2=78, p=0.02).

Academic Journals (AJ)

There was a significant gender difference for “Alert services” (U=3544.5, n1=111, n2=77, p=0.04), which female respondents tended to use more than males.

Library Services (LS)

The highly significant gender difference in this group was for “Visiting the library or its website” (U=3395.0, n1=111, n2=78, p=0.01), with females having a higher mean rank than males.

Alert Services (AS)

The gender difference for “Set up feeds for academic databases” was significant ($U=3433.5$, $n_1=109$, $n_2=77$, $p=0.03$); again, females responded positively more often than males.

Multimedia (MM)

Results in the multimedia category show that males reported looking at technical diagrams significantly more often than females ($U=3189.5$, $n_1=110$, $n_2=75$, $p=0.01$).

Other Sources (OS)

Finally, males were highly significantly more likely than females to report using search engines ($U=3427.5$, $n_1=111$, $n_2=78$, $p=0.01$).

The analysis showing that females tended to use four of KUTD methods more often than males, who in turn used two others more often, this total of 6 significant individual methods have been affected by gender. Overall, gender turns out to affect some of KUTD methods which mean that more tendency of gender affects for example professional associations, alert services, visit the library or its website, setting up feeds for academic databases, looking at technical diagrams and use search engine websites.

6.8.2 Age Differences in Methods Used

The Kruskal-Wallis test was used in all comparisons between more than two groups, including the age groups. This method depends (as does the Mann-Whitney U test) on ranking the data and is a non-parametric test which determines whether there is a difference between three or more sets of values. As with the Mann-Whitney U test, the overall difference between the means of the groups was considered significant if the p-value was found to be less than 0.05. The age variable involved a total of 5 groups and in order to determine where the differences occurred, pairwise comparisons were used. This is a method of analysis of multiple population means in pairs, in order to determine whether they are significantly different from each other. Post hoc tests were used to measure the differences between the means of two groups. Finally, Bonferroni correction was used to reduce the chances of obtaining false-positive results (type I errors). This procedure reduces p-values when multiple pairwise tests are performed on a single dataset. The p-values of all pairwise comparisons reported in this chapter have been Bonferroni adjusted.

To interpret the findings, one must first determine the overall significance and then find where significant differences occur between pairs of groups. In some cases there will be a significant overall difference, but the pairwise tests will reveal no significant differences, even with the highest mean rank for a particular group. In other cases there will be a significant overall difference and the pairwise difference will be significant as well. The results for each case are interpreted at the end of this section. The above explanation of the Kruskal-Wallis test applies to all comparisons between more than two groups reported in this chapter.

To determine whether age had any effect on KUTD methods used, the Kruskal-Wallis test was used to check for significant differences among the 5 age groups, providing strong evidence of a difference ($p < 0.05$) between the mean ranks of at least one pair of groups. Pairwise tests were then performed on the groups to identify the most important KUTD methods.

Table 18 lists the mean ranking of the KUTD methods for each age group, indicating significant differences ($p < 0.05$) for 6 of the 26 methods: “TOC”, “Alert services”, “Attend different events”, “Follow certain academics or authors”, “Cited by Google” and “Use specialised applications to import all cited papers”. The following subsections focus only on the four categories in which these significant results were found.

	Methods	Chi-square	P value	Mean rank				
				Age				
				21-30	31-40	41-50	51-60	>60
AT	Databases or bibliographies	2.928	0.57	101.7	87.52	103.6	92.98	96.60
	Sharing websites	7.727	0.10	103.5	91.17	93.61	103.0	57.60
	Professional associations	6.671	0.15	87.72	94.79	101.4	120.6	97.35
AJ	Online table of contents	25.979	0.00	76.25	96.47	131.9	115.9	127.9
	Alert services	10.03	0.04	83.10	98.28	119.8	111.69	97.00
PE	Attend different events	10.13	0.04	84.01	97.29	110.1	110.43	124.3
	Scan list of conference papers	6.144	0.19	87.48	95.80	99.61	118.9	99.45
	Ask my colleagues	1.679	0.79	97.05	92.03	88.00	106.48	95.70
LS	Ask the library staff	2.364	0.67	94.05	93.15	106.18	85.38	102.40
	Visit the library or its website	2.242	0.69	96.63	92.65	111.95	89.55	95.45
	Scan the library shelves	5.066	0.28	95.26	98.20	113.63	87.38	72.50
SM	Post questions on social networks	5.962	0.20	96.50	103.76	92.05	82.00	71.40
	Follow certain academics or authors	20.92	0.00	91.65	114.52	87.63	88.33	37.65
	Follow the latest research conducted by research groups	3.754	0.44	91.36	104.98	93.21	88.71	79.15
	Follow the latest research conducted by significant independent researchers in my field	3.758	0.44	90.37	101.40	84.18	109.24	91.60
AS	Set up alert services to notify me of new papers	4.533	0.34	89.87	102.40	86.08	103.64	72.88
	Set up feeds for academic databases	5.162	0.27	85.28	102.59	93.29	107.17	89.19
CS	Cited by Google Scholar	13.17	0.01	92.37	110.58	80.26	97.00	52.25
	Use specialised applications to import all cited papers	22.38	0.00	111.55	98.52	67.32	78.86	49.30
	Follow references cited in an interesting paper	1.456	0.83	93.76	101.34	98.13	91.88	84.40
	Follow authors who cited interesting papers	.738	0.95	98.31	95.80	90.18	98.00	86.10
MM	Look at technical diagrams	4.339	0.36	101.41	91.72	84.97	77.33	101.67
	Watch video clips	5.083	0.28	103.37	89.93	88.26	104.79	73.05
	Listen to audio clips	8.498	0.07	92.92	92.36	100.05	124.83	74.75
OS	Search engine websites	4.247	0.37	101.92	89.60	81.47	104.48	99.90
	Scan Amazon for new books	4.974	0.29	87.00	97.86	108.74	110.24	100.40

Table 18: Age and KUTD Methods

Academic Journals (AJ)

The table shows that there were significant differences for both methods in the AJ group. There was a highly significant overall difference among the age groups for “TOC”: $H(5)=25.979$, $p<0.001$. Pairwise comparison results reveal significant differences between the youngest age group and each of the three oldest groups: 21-30/51-60 ($n_1=78$, $n_2=21$, $p=0.02$), 21-30/>60 ($n_1=78$, $n_2=10$, $p=0.04$) and 21-30/41-50 ($n_1=78$, $n_2=19$, $p<0.001$). Table 28 shows that the middle age group (41-50) was more likely to use online TOCs than the older or younger groups.

There was also a significant overall difference for “Alert services”, $H(5)=10.025$, $p=0.04$, but no significant pairwise differences ($p >0.05$, Bonferroni adjusted) between age groups.

People and Events (PE)

Similarly, there was a significant overall difference for “Attend different events”, $H(5)=10.126$, $p=0.04$, but no significant pairwise differences ($p>0.05$) among the age groups.

Social Media (SM)

There was a highly significant overall difference for “Follow certain academics or authors”, $H(5)=20.921$, $p<0.001$, and highly significant pairwise differences between the oldest group and each of the youngest two: 21-30/>60 ($n_1=78$, $n_2=10$, $p=0.02$); 31-40/>60 ($n_1=62$, $n_2=10$, $p<0.001$). Younger users were generally more likely to follow certain academics or authors than older ones, the highest mean rank being for the 31-40 group and the lowest for the oldest group.

Citation Services (CS)

There were significant age differences for two of the four citation services methods. There was a significant overall difference for “Cited by Google Scholar”, $H(5)=13.171$, $p=0.01$, and 4 significant pairwise age differences for this method, 3 involving the oldest group, which had the lowest mean rank, and 2 involving the second-youngest, whose members were most to use this method; for example, 31-40/>60 ($n_1=62$, $n_2=10$, $p=0.01$) Table 19.

Sample 1/Sample 2	Sig	Adj. Sig
21-30/>60	.026	.262
51-60/>60	.030	.302
31-40/41-50	.031	.314
31-40/>60	.001	.014

Table 19: Pairwise Age differences for Cited by Google Scholar

There was a highly significant overall age difference for “Use specialised applications to import all cited papers”, $H(5)=22.379$, $p<0.001$, and 2 significant pairwise differences, both involving the youngest group, which was the most likely to use this method: 21-30/>60 ($n_1=78$, $n_2=10$, $p=0.00$); 21-30/41-50 ($n_1=78$, $n_2=19$, $p=0.01$).

In conclusion, there appear to have been some significant age differences for a total of 6 methods, in 4 of the 9 categories. Therefore, it can be concluded that age had an overall effect on the use of different individual KUTD methods. While all age groups used the “TOC” method, the 41-50 age group tended to use it more than the others. “Follow certain academics or authors” and “Cited by Google Scholar” were used more by the 31-40 group than by other

groups, with the lowest mean rank for the over-60s. This oldest group also had the lowest mean rank for “Use specialised applications to import all cited papers”, which the 21-30 age group tended to use more than all other age groups.

6.8.3 Experience and Methods Used

This section examines evidence for the effect on KUTD methods used of length of experience, divided into 5 ranges: less than a year, 1 to less than 4 years, 4 to less than 6 years, 6 to less than 10 years and 10 years or more. Table 20 list the Kruskal-Wallis test results, showing significant differences ($p < 0.05$) for only 3 of the 26 methods: “Ask the library staff”, “Post questions on social networks” and “Follow certain academics or authors”, as detailed below.

	Methods	Chi-square	P value	Mean rank Experience (years)			
				<1	4 - <6	6 - <10	≥10
AT	Databases or bibliographies	5.667	0.13	73.22	96.28	98.85	102.4
	Sharing websites	1.286	0.73	85.06	96.42	99.17	98.17
	Professional associations	3.558	0.31	98.74	87.12	90.98	103.4
AJ	Online table of contents	4.398	0.22	81.32	91.11	94.19	104.6
	Alert services	3.787	0.28	93.34	93.80	80.50	103.3
PE	Attend different events	3.693	0.30	94.58	89.22	89.39	104.9
	Scan list of conference papers	4.847	0.18	82.54	96.25	83.13	103.9
	Ask my colleagues	2.785	0.43	97.48	87.15	103.7	99.23
LS	Ask the library staff	12.3	0.01	115.8	101.8	91.83	82.16
	Visit the library or its website	1.908	0.59	108.4	97.15	90.65	92.75
	Scan the library shelves	6.517	0.09	111.6	100.6	100.9	84.93
SM	Post questions on social networks	14.5	0.00	129.3	92.34	98.11	86.36
	Follow certain academics or authors	14.30	0.00	129.4	97.81	95.44	82.49
	Follow the latest research conducted by research groups	2.114	0.55	108.8	94.73	95.22	90.69
	Follow the latest research conducted by significant independent researchers in my field	5.153	0.16	99.63	91.57	115.9	90.17
AS	Set up alert services to notify me of new papers	3.660	0.30	104.4	99.49	80.17	92.01
	Set up feeds for academic databases	0.586	0.90	98.60	97.02	90.28	92.42
CS	Cited by Google Scholar	0.841	0.84	96.34	99.80	89.54	93.53
	Use specialised applications to import all cited papers	2.110	0.55	93.04	102.9	98.00	90.20
	Follow references cited in an interesting paper	2.521	0.47	89.56	89.78	99.41	102.4
	Follow authors who cited interesting papers	0.178	0.98	96.30	94.40	99.57	96.00
MM	Look at technical diagrams	0.667	0.88	101.8	92.06	91.41	94.09
	Watch video clips	1.511	0.68	107.6	93.97	97.83	93.18
	Listen to audio clips	2.717	0.44	106.9	89.97	104.9	94.39
OS	Search engine websites	1.122	0.77	95.36	92.51	104.8	96.07
	Scan Amazon for new books	2.732	0.43	108.9	96.55	84.59	95.32

Table 20: Experience and KUTD Methods

Library Services (LS)

There was an overall significant difference among experience groups for “Ask the library staff”, $H(5)=12.300$, $p=0.01$, with the least experienced participants being most likely to ask, and one significant pairwise difference, between the groups with the longest and shortest experience ($n_1=25$, $n_2=74$, $p<0.001$).

Social Media (SM)

Similarly, there was a highly significant overall difference among the experience groups for “Follow certain academics or authors”, $H(5)=14.296$, $p<0.001$, the least experienced having the highest mean rank score, and a single significant pairwise difference, between the most and least experienced groups ($n_1=74$, $n_2=24$, $p<0.001$).

There was also a highly significant overall difference among the experience groups for “Post questions on social networks” $H(5)=14.500$, $p<0.001$, again with the least experienced group being most likely to use this method Table 30. In this case, there were 2 significant pairwise differences, between the most and least experienced groups ($n_1=74$, $n_2=24$, $p<0.001$) and between the 4 to <6 years and the <1 year groups ($n_1=65$, $n_2=24$, $p<0.001$).

To summarise, “Ask the library staff”, “Follow certain academics or authors” and “Post questions on social networks” showed significant differences in usage related to length of experience, with the least experienced group being more likely than the other groups to use these three methods.

6.8.4 Position and Methods Used

In order to determine whether users’ position had any effect on their choice of KUTD methods, the Kruskal-Wallis test was used to check for any differences in using KUTD methods among the 7 groups listed in Table 21 providing strong evidence of a difference ($p<0.05$) between the mean ranks of at least one pair of groups. The group means were then subjected to pairwise tests to identify the most important KUTD methods. Table 21 shows significant differences, detailed below, for 8 of the 26 methods: “TOCs”, “Alert services”, “Attend different events”, “Ask the library staff”, “Visit the library or its website”, “Scan the library shelves”, “Use specialised applications to import all cited papers” and “Look at technical diagrams”.

	Methods	Chi-Square	P value	Mean rank						
				Prof	Reader	Senior Lecturer	Lecturer	Research Fellow	Research associate	PhD
AT	Databases or bibliographies	3.647	0.72	97.73	104.4	101.7	79.86	77.00	102.9	95.19
	Sharing websites	7.374	0.29	59.85	109.8	90.69	96.50	102.7	101.9	96.52
	Professional associations	11.43	0.08	98.54	129.9	79.88	118.5	67.00	91.91	89.42
AJ	Online table of contents	31.14	0.00	126.9	160.3	115.6	113.9	68.50	88.97	79.05
	Alert services	13.34	0.04	128.9	122.6	118.4	92.90	123.7	85.60	88.28
PE	Attend different events	20.86	0.00	128.1	143.8	104.4	111.2	71.67	91.85	82.68
	Scan list of conference papers	12.13	0.06	117.5	134.2	102.8	105.2	69.33	94.79	84.69
	Ask my colleagues	10.91	0.09	93.58	142.31	69.04	94.40	99.83	100.6	92.00
LS	Ask the library staff	13.88	0.03	76.92	110.3	88.08	80.00	97.83	82.10	106.0
	Visit the library or its website	14.60	0.02	79.77	123.8	85.04	87.36	59.83	79.71	108.5
	Scan the library shelves	17.31	0.00	81.69	112.3	67.54	92.20	84.33	79.00	110.0
SM	Post questions on social networks	2.700	0.84	77.69	87.50	91.31	91.56	96.33	100.0	97.41
	Follow certain academics or authors	5.563	0.47	67.15	105.5	101.5	92.88	73.00	92.14	100.1
	Follow the latest research conducted by research groups	8.069	0.23	61.46	102.6	114.8	87.82	107.0	94.19	97.39
	Follow the latest research conducted by significant independent researchers in my field	3.500	0.74	83.88	97.25	110.7	91.98	134.5	94.82	93.66
AS	Set up alert services to notify me of new papers	5.575	0.47	70.05	115.7	102.1	97.60	128.00	91.24	92.95
	Set up feeds for academic databases	7.614	0.27	84.00	130.1	102.1	100.7	131.83	92.37	88.09
CS	Cited by Google Scholar	10.69	0.10	72.04	104.0	90.23	122.6	64.50	91.67	93.00
	Use specialised applications to import all cited papers	25.80	0.00	52.27	94.13	62.81	82.10	89.33	90.97	113.7
	Follow references cited in an interesting paper	3.236	0.78	96.31	117.50	106.2	102.9	90.00	91.21	91.85
	Follow authors who cited interesting papers	6.609	0.36	74.35	126.88	85.54	91.16	93.50	91.02	100.9
MM	Look at technical diagrams	18.50	0.00	53.86	74.44	78.33	74.98	93.33	92.45	108.7
	Watch video clips	10.63	0.10	81.81	86.50	58.42	91.76	88.83	95.10	105.7
	Listen to audio clips	4.119	0.66	98.35	122.94	75.38	94.96	92.00	95.91	95.64
OS	Search engine websites	5.760	0.45	106.2	114.94	81.62	88.80	52.00	93.77	98.54
	Scan Amazon for new books	4.400	0.62	88.08	128.94	90.50	100.6	108.67	90.41	94.87

Table 21: Position and KUTD Methods

Academic Journals (AJ)

In the AJ category, there were significant overall differences for both “TOC” and “Alert services”. The “TOC” results appeared highly significant, $H(7)=31.142$, $p<0.001$, with

Readers being much more likely than other groups to consult online tables of contents, and significant pairwise differences were found between PhD students and Readers ($n_1=84$, $n_2=8$, $p<0.001$) and between Research associates and Readers ($n_1=43$, $n_2=8$, $p=0.01$).

In the case of “Alert services”, there was a significant overall difference, $H(7)=13.342$, $p=0.04$, but no significant pairwise differences were found among the position groups.

People and Events (PE)

There was one highly significant overall difference in the PE category, $H(7)=20.855$, $p=0.02$, for “Attend different events”, which Readers reported doing more often than other groups Table 31. There was just one statistically significant pairwise difference, between PhD students and Readers ($n_1=85$, $n_2=8$, $p=0.03$).

Library Services (LS)

There were significant overall differences for all 3 methods in the LS category. For “Ask the library staff”, the overall result was significant, $H(7)=13.880$, $p=0.03$, but there were no significant pairwise differences ($p>0.05$) among the positions. The same is true of “Visiting the library or its website”, $H(7)=14.601$, $p=0.02$; again, but pairwise comparison revealed no significant differences.

The overall difference for “Scan the library shelves” was highly significant, $H(7) =17.310$, $p<0.001$, and there was a significant pairwise difference between Research associates and PhD students ($n_1=43$, $n_2=85$, $p=0.02$). The results suggest that PhD students tended to scan the shelves more than the other groups.

Citation Services (CS)

There was one highly significant overall difference in the CS category, for “Use specialised applications to import all cited papers”, $H(7)=25.798$, $p<0.001$, where PhD students had the highest mean rank, and there were 2 significant pairwise differences, between PhD students and Professors ($n_1=85$, $n_2=13$, $p<0.001$) and between PhD students and Senior lecturers ($n_1=85$, $n_2=13$, $p=0.02$).

Multimedia (MM)

In the MM category, there was a highly significant overall difference for “Look at technical diagrams”, $H(7)=18.496$, $p<0.001$, where PhD students had the highest rank, and there was one significant pairwise difference, between Professors and PhD students ($n_1=11$, $n_2=84$, $p=0.02$).

Thus, there is evidence that position had a significant effect on KUTD use for 5 with methods. For example, use of “TOCs”, “Attend different events”, “Scan the library shelves”, import all cited papers using specialised applications and “Look at technical diagrams” are most affected methods by the position of staff and PhD students.

6.8.5 Faculty and Methods Used

The results in Table 22 indicate significant ($p < 0.05$) overall differences for 8 of the 26 methods: “Professional associations”, “TOC”, “Alert services”, “Attend different events”, “Follow certain academics or authors”, “Cited by Google”, “Follow references cited in an interesting paper” and “Look at technical diagrams”.

	Methods	Chi-Square	P value	Mean rank		
				Engineering	HASS	Sciences
AT	Databases or bibliographies	2.764	0.25	100.0	83.24	97.72
	Sharing websites	2.015	0.36	100.5	86.14	95.02
	Professional associations	6.640	0.04	89.79	115.5	92.17
AJ	Online table of contents	15.09	0.00	81.38	118.2	103.9
	Alert services	8.026	0.02	84.69	108.6	105.23
PE	Attend different events	10.54	0.00	84.65	115.1	102.35
	Scan list of conference papers	4.624	0.09	88.21	109.4	98.42
	Ask my colleagues	2.469	0.29	89.74	99.08	102.71
LS	Ask the library staff	0.038	0.98	93.88	95.50	94.88
	Visit the library or its website	0.410	0.81	95.07	100.9	94.27
	Scan the library shelves	0.768	0.68	97.99	98.43	91.02
SM	Post questions on social networks	1.456	0.48	92.05	94.59	101.9
	Follow certain academics or authors	8.511	0.01	85.07	98.55	110.9
	Follow the latest research conducted by research groups	1.208	0.55	90.77	99.87	98.74
	Follow the latest research conducted by significant independent researchers in my field	3.558	0.17	88.24	104.4	101.7
AS	Set up alert services to notify me of new papers	3.171	0.20	89.16	92.73	104.73
	Set up feeds for academic databases	3.844	0.15	87.24	99.04	103.8
CS	Cited by Google Scholar	10.062	0.01	87.2	87.87	114.4
	Use specialised applications to import all cited papers	5.383	0.07	100.72	78.16	99.94
	Follow references cited in an interesting paper	8.505	0.01	89.52	87.11	112.9
	Follow authors who cited interesting papers	3.040	0.22	89.62	98.70	104.9
MM	Look at technical diagrams	17.41	.000	104.3	61.56	97.42
	Watch video clips	2.557	0.28	100.16	83.80	97.29
	Listen to audio clips	3.160	0.21	95.78	108.05	88.33
OS	Search engine websites	1.035	0.59	95.11	90.58	101.1
	Scan Amazon for new books	2.540	0.28	92.58	108.28	93.57

Table 22: Faculty and KUTD Methods

Academic Tools (AT)

In the AT category, there was an overall significant difference among faculties, $H(3)=6.640$, $p=0.04$, for “Professional associations”, which members of HASS tended to use more than others, and a single significant pairwise difference, between Engineering and HASS ($n_1=96$, $n_2=37$, $p=0.04$).

Academic Journals (AJ)

Overall highly significant differences were found for both AJ methods. The result for “TOC” was highly significant, $H(3)=15.091$, $p<0.001$, with HASS participants tending to consult tables of contents the most. Pairwise comparisons revealed significant differences between Engineering and Science ($n_1=95$, $n_2=57$, $p=0.03$) and between Engineering and HASS ($n_1=95$, $n_2=38$, $p=0.01$).

The overall result for “Alert services” was highly statistically significant, $H(3)=8.026$, $p=0.02$, but pairwise differences were not significant.

People and Events (PE)

There was a highly significant overall difference for “Attend different events”, $H(3)=10.538$, $p<0.001$, with HASS once more having the highest mean rank, and one statistically significant pairwise difference on this method, between Engineering and HASS ($n_1=96$, $n_2=38$, $p<0.001$). Differences among faculties for both other PE methods were insignificant.

Social Media (SM)

There was a significant overall difference for one of the four SM methods, namely “Follow certain academics or authors”, $H(3)=8.511$, $p=0.01$ Table 23, which Science Faculty members were most likely to use, and a significant pairwise difference between Engineering and Science ($n_1=95$, $n_2=57$, $p=0.01$).

Citation Services (CS)

Two of the four CS methods were found to have significant results. “Cited by Google Scholar” showed a highly significant overall difference, $H(3)=10.062$, $p=0.01$, with Science Faculty members much more likely than others to use this service. Again, pairwise comparison revealed a statistically significant difference between Engineering and Science ($n_1=95$, $n_2=57$, $p=0.01$).

The other CS method with a significant overall difference among faculties was “Follow references cited in an interesting paper”, $H(3)=8.505$, $p=0.01$, which Science Faculty participants were again most likely to use. Pairwise comparison once more revealed a single significant difference, between Engineering and Science ($n_1=96$, $n_2=57$, $p=0.02$).

Multimedia (MM)

Finally in the faculty results, there was a highly significant overall difference for “Look at technical diagrams”, $H(3)=17.406$, $p<0.001$, with the highest mean rank for Engineering and statistically significant pairwise differences between HASS and Science ($n_1=36$, $n_2=56$, $p<0.001$) and between HASS and Engineering ($n_1=36$, $n_2=95$, $p<0.001$).

In summary, HASS members tended to use professional association websites, consult “Professional associations”, “TOC”, “Attend different events”: Science Faculty members were more likely to follow certain academics or authors, use Cited by Google Scholar and follow references cited in interesting papers; and Engineering participants tended to use “Look at technical diagrams. There were thus significant results suggesting that faculty membership could affect the use of 7 individual KUTD methods. Furthermore, it can be concluded that faculty membership was an important factor that can affect the use of different KUTD methods.

6.8.6 Perceived Importance and Methods Used

In order to determine whether participants’ perceptions of the importance of KUTD affected their usage of the 26 methods, the Kruskal-Wallis test was used, Table 23 yielding evidence of a significant difference ($p<0.05$) between the mean ranks of at least one pair of groups in the case of 6 methods: “TOC”, “Attend different events”, “Scan lists of conference papers”, “Ask my colleagues”, “Visit the library or its website” and “Listen to audio clips”.

	Methods	Chi-Square	P value	Mean rank			
				Less important	Neither important nor unimportant	Important	Very important
AT	Databases or bibliographies	5.721	0.13	109.5	8.50	86.04	100.8
	Sharing websites	4.001	0.26	145.0	145.0	86.50	99.3
	Professional associations	6.788	0.08	145.5	11.0	84.90	100.3
AJ	Online table of contents	10.4	0.01	69.00	7.50	79.72	102.9
	Alert services	4.276	0.23	113.0	31.5	85.73	99.89
PE	Attend different events	15.71	0.00	63.50	2.50	76.38	105.2
	Scan list of conference papers	19.00	0.00	87.50	7.50	72.29	106.1
	Ask my colleagues	9.544	0.02	147.0	5.00	82.15	101.5
LS	Ask the library staff	1.947	0.58	142.5	61.5	91.35	95.71
	Visit the library or its website	8.719	0.03	78.50	27.5	80.59	103.1
	Scan the library shelves	5.146	0.16	186.5	46.5	89.75	98.32
SM	Post questions on social networks	1.235	0.74	131.0	56.5	96.90	94.93
	Follow certain academics or authors	2.239	0.52	79.50	116.0	87.04	99.05
	Follow the latest research conducted by research groups	7.546	0.07	57.50	107.5	79.29	101.7
	Follow the latest research conducted by significant independent researchers in my field	7.993	0.05	57.50	20.0	82.08	102.0
AS	Set up alert services to notify me of new papers	4.135	0.25	93.50	36.5	84.86	99.11
	Set up feeds for academic databases	4.433	0.22	84.50	34.0	84.59	99.31
CS	Cited by Google Scholar	0.974	0.81	131.0	131.0	96.95	94.35
	Use specialised applications to import all cited papers	2.877	0.41	142.0	39.0	90.21	98.52
	Follow references cited in an interesting paper	7.210	0.06	90.50	3.50	84.73	101.5
	Follow authors who cited interesting papers	5.978	0.11	130.0	11.5	85.70	100.7
MM	Look at technical diagrams	0.683	0.88	66.50	108.0	90.58	95.55
	Watch video clips	6.014	0.11	55.50	55.5	83.20	102.0
	Listen to audio clips	10.39	0.02	174.0	22.5	81.06	102.3
OS	Search engine websites	4.232	0.24	6.00	145	93.88	97.20
	Scan Amazon for new books	4.834	0.18	92.50	188	87.48	98.92

Table 23: Importance and KUTD Methods

Academic Journals (AJ)

An overall significant difference was found between the different levels of importance for “TOC”, $H(5)=10.436$, $p=0.01$, this method being ranked most highly by participants who thought it very important to KUTD. Pairwise comparisons indicate only one significant difference, between important and very important ($n_1=55$, $n_2=133$, $p=0.04$).

People and Events (PE)

Significant results were obtained for all three PE methods. First, there was a highly significant overall difference among levels of perceived importance for “Attend different events”, $H(4)=15.709$, $p<0.001$, the highest mean rank being for the “very important” group, and a single significant pairwise difference, between important and very important ($n_1=56$, $n_2=133$, $p=0.003$). The overall difference between levels of importance for “Scan list of conference papers” was also highly significant, $H(4)=19.003$, $p<0.001$, with those who deemed KUTD very important again being most likely to adopt this method. Once more, the only significant pairwise difference was between important and very important ($n_1=56$, $n_2=132$, $p<0.001$). The results for the third method, “Ask my colleagues”, showed a significant overall difference, $H(4)=9.544$, $p=0.02$, but there were no significant pairwise differences.

Library Services (LS)

An overall significant difference between levels of importance was noted for only one method of the library service: “Visiting the library or its website”, $H(5)=8.719$, $p=0.03$, which those considering KUTD and no significant pairwise differences Table 23.

Multimedia (MM)

The results for the MM category showed a significant overall difference between levels of importance for just one method, “Listen to audio clips”, $H(5)=10.393$, $p=0.02$, but no significant pairwise differences.

In conclusion, the use of only 3 individual methods (TOC, Attend different events, Scan lists of conference papers and Visit the library or its website) appears to have been affected by participants’ perceptions of the importance of KUTD.

6.8.7 Perceived Difficulty and Methods Used

This section examines the relationship between KUTD methods used and participants’ perceptions of the difficulty of keeping up to date. As noted in in Table 46 Appendix 12, the majority of participants reported no such difficulty and 18% found it easy or very easy, although 33.8% did consider it difficult and 4.3% very difficult. As with other variables, the Kruskal-Wallis test was conducted and identified significant differences ($p<0.05$) between the mean ranks of at least one pair of groups for three methods, namely “Attend different

events”, “Ask my colleagues” and “Visit the library or its website” Table 101 Appendix 15, then the data for these methods were subjected to pairwise comparisons.

People and Events (PE)

There was an overall significant difference among levels of difficulty for “Attend different events”, $H(5)=9.806$, $p=0.04$, but no significant pairwise differences were found. A highly significant overall difference was also found for one other PE method, “Ask my colleagues”, $H(5)=14.463$, $p<0.001$, again with those finding KUTD easy being most likely to adopt it. Here, there was a significant pairwise difference, between “Very difficult” and “Easy” ($n_1=9$, $n_2=30$, $p<0.001$).

Library Services (LS)

There was only one other significant overall difference among levels of difficulty for any of the remaining methods, namely “Visit the library or its website”, $H(5)=10.472$, $p=0.03$, but there were no significant pairwise differences.

In conclusion, 3 individual methods were overall significant and only a single pairwise difference between levels of difficulty was found, leading to conclusion that perceived difficulty can influence limited number of KUTD methods.

6.8.8 Past and Future KUTD Training

Most respondents had not attended any KUTD training courses in the past. The results reported in Table 48 Appendix 12 show that attendance at the Library’s training sessions was very low (8.7%) and that only (14%) of participants had taken part in other online courses. This low attendance may be explained by the limited possibilities available. On the other hand, when participants were asked about their willingness to attend training session to learn about KUTD, 44% said they would attend, around twice as many as those who would not (23.2%) or those who were not sure (22%). This section reports the analysis of differences of age, gender, faculty and position in responses to 3 questions about training sessions: whether participants had attended library training, whether they had taken other online courses and whether they would be willing to attend KUTD training in future.

Age and KUTD Training

When the Kruskal-Wallis test was applied to the responses of the 5 age groups, no significant differences were found Table 102 Appendix 15.

Gender and KUTD Training

There were also no significant differences in attending training courses by gender Table 103 Appendix 15.

Position and KUTD Training

No significant differences in past training attendance were found among the 7 position groups, but willingness to attend KUTD training did differ significantly, $H(7)=17.75$, $p<0.001$, Research associates being most willing. There was a single significant pairwise difference, between PhD students and Research associates: ($n_1=82$, $n_2=41$, $p=0.01$) Table 104 Appendix 15.

Faculty and KUTD Training

There were no significant differences in training attendance by faculty Table 105 Appendix 15.

6.8.9 Ability to KUTD and Methods Used

More than half of participants considered themselves competent in KUTD, as stated in Table 49 Appendix 12. The reasons for this largely positive self-assessment will be discussed in the factors motivating chapter 7 meanwhile, participants did not know the most effective ways to KUTD and had no idea about the KUTD methods used by other people in the field, while varying in their own preferred methods and self-assessed competence.

This section considers whether participants' self-reported KUTD ability affected their use of different KUTD methods. The Kruskal-Wallis test provided strong evidence of a difference ($p<0.05$) between the mean ranks of at least one pair of ability groups. The results in Table 106 Appendix 15 indicate significant differences for 8 of the 26 methods: "Databases or bibliographies", "Professional associations", "TOC", "Attend different events", "Scan lists of conference papers", "Ask my colleagues".

Academic Tools (AT)

There was a highly significant overall difference for “Databases or bibliographies”, $H(5)=13.932$, $p<0.001$, with the “Expert” group having the highest mean rank, and significant pairwise differences between the “Beginner” and “Competent” groups ($n_1=43$, $n_2=23$, $p<0.001$) and between the beginners and the experts ($n_1=43$, $n_2=23$, $p<0.001$).

The overall difference for “Professional associations” was also significant, $H(5)=8.901$, $p<0.001$, the experts again being the most likely to use this method and there was a significant pairwise differences between Beginner/Expert ($n_1=43$, $n_2=23$, $p<0.001$).

Academic Journals (AJ)

There was a single highly significant overall difference in the AJ category, for “TOC”, $H(5)=14.882$, $p<0.001$, with the 2 significant pairwise differences. Beginner/Competent ($n_1=42$, $n_2=123$, $p<0.001$) and between Beginner/Expert ($n_1=42$, $n_2=23$, $p<0.001$).

People and Events (PE)

All three methods in the PE category had highly significant overall differences. For “Attend different events” the result was $H(5)=13.059$, $p<0.001$, with expert users giving the highest mean rank and there were again significant pairwise differences between beginners and experts ($n_1=43$, $n_2=23$, $p<0.001$).

Similarly, the expert group was most likely to scan lists of conference papers and there was a highly significant overall difference, $H(5)=20.844$, $p<0.001$. Once more, there were significant pairwise differences between beginners and each of the other groups: Beginner/Competent ($n_1=43$, $n_2=122$, $p<0.001$) and between Beginner/Expert ($n_1=43$, $n_2=23$, $p<0.001$).

Self-declared expert users were also most likely to ask their colleagues and the overall difference was highly significant, $H(5)=10.198$, $p<0.001$ Table 39. Here, there was a single significant pairwise difference, between beginners and experts ($n_1=43$, $n_2=122$, $p<0.001$).

In summary, self-reported expertise at KUTD was found to affect the choice of a total of 6 methods. It must be concluded that participant’s ability appeared to have some effect on their use of individual KUTD methods.

6.8.10 Obstacles to KUTD

When participants were asked about obstacles to keeping up to date, as reported in Table 51 Appendix 12. that 66% agreed that lack of time was an obstacle, only 27% identified lack of awareness and a mere 11% claimed to face no obstacles. This section considers whether age, gender, faculty or position influenced responses to these three binary questions.

Age and Obstacles

There was no single significant among age groups and obstacles Table 107 Appendix 15.

Gender and Obstacles

Only one highly significant gender difference was found: females were significantly more likely than males to agree that lack of time was an obstacle to keeping up to date Table 108 Appendix15.

Position and Obstacles

Table 109 Appendix15 shows that there were highly significant overall differences among position groups for two responses: on lack of awareness, $H(7)=18.522$, $p<0.001$, but where there were no significant pairwise differences, and on lack of time, $H(7)=16.339$, $p=0.01$, where Senior lecturers had the highest mean rank and where there was one significant pairwise difference, between PhD students and Senior lecturers ($n_1=96$, $n_2=13$, $p=0.02$).

Faculty and Obstacles

There was a highly significant overall difference among faculty groups, $H(3)=8.524$, $p=0.01$ in identifying lack of awareness as an obstacle, but no significant pairwise differences Table 110 Appendix15.

In summary, participants generally considered lack of time the main obstacle to KUTD and females were significantly more likely to agree that it was an obstacle, but age had no significant effect. Senior lecturers were most likely to see lack of time as an obstacle.

6.8.11 Library Services and KUTD

6.8.11.1 “Yes” and “No” Questions

The first section of the questionnaire included the following yes/no questions on general behaviour and awareness of KUTD services at the University of Strathclyde:

Q16 Are you aware of the services provided by the university library to help you to KUTD?

Q17 Have you ever sought the help of a librarian to KUTD?

Q18 Would you like help in using keep-up-to-date services provided by the library?

Q19 Have you ever used the library's keep-up-to-date services?

This section analyses the responses to identify any significant differences by age, gender, faculty or position in the use of the library's KUTD services.

As skip logic was used in both Q16 and Q19, total responses to these yes/no items were low compared to other parts of the questionnaire: 190 responses to Q16 and 114 to each of Q17, Q18 and Q19. Despite the low numbers of responses to the library services section and to the yes/no items in particular, the results nevertheless give a good indication of the extent to which staff and PhD students used the library's KUTD services.

The results reported in Table 52 Appendix12. show that half of respondents were not aware of the KUTD services provided by the university, while over 42% had never sought a librarian's help or used the library's KUTD services and just 23% indicated that they would like help in using these services.

Age and "Yes" and "No" Questions

The Kruskal-Wallis test revealed no significant differences among age groups in their responses to any of the yes/no items Table111 Appendix15.

Gender and "Yes" and "No" Questions

As Table 112 Appendix15 shows, the Mann-Whitney U test found no significant gender differences in any of the yes/no responses.

Position and "Yes" and "No" Questions

There were insignificant differences among respondents by position in response to all yes/no questions on services except Q18; Research associates were the group most likely to state that they would like help in using KUTD services and there was a highly significant overall difference among the positions, $H(7)=23.110$, $p=0.01$ Table 113 Appendix15. There was also one significant pairwise difference, between PhD students and Research associates ($n_1=47$, $n_2=27$, $p<0.001$). This finding is in line with the result reported in (Section 6.8.8 in Position and KUTD Training part), that Research associates were significantly more likely than PhD students to be willing to attend KUTD training.

Faculty and “Yes” and “No” Questions

The Kruskal-Wallis test found no significant differences among faculty groups in their responses to the yes/no items on services Table 114 Appendix15.

6.8.11.2 Helpful KUTD Services

Q20 asked participants to rate the helpfulness of four KUTD services, with the option of stating that they had not used them. In Table 53 Appendix15 shows that the most frequent answers in all cases were “Not used” and “Helpful”, given by approximately 20% and 5% of participants respectively to all of the services. The following subsections show very little evidence of differences in non-use of these services by the various groups.

Age and KUTD Services

There was an overall significant age difference in non-use of the emailing of new content, $H(5)=10.453$, $p=0.03$, but no significant pairwise differences. No significant age differences were found for either of the other services Table 115 Appendix15.

Gender and KUTD Services

There were no significant differences in non-use of any of the university library’s KUTD services by gender Table 116 Appendix15.

Position and KUTD Services

There was no significant overall difference by position on a single service, namely “List of publications in your field” Table 117 Appendix15.

Faculty and KUTD Services

Table 118 Appendix15 shows no significant differences in using services among the faculty groups.

6.8.11.3 Statements about KUTD Services

Q21 asked participants to state their degree of agreement with statements about six more library KUTD services and as with the previous item, the most frequent answer was “Not used” Table 54 Appendix12.

Age and use of Services

There were statistically significant differences among the age groups in their responses to only 3 of the 6 items, as shown in the first 2 columns of Table 119 Appendix 15. There was a significant overall difference on “Access links related to keep-up-to-date services”, $H(5)=10.824$, $p=0.03$, with the highest mean rank for the 41-50 year group, and significant pairwise differences between 51-60/31-40 ($n_1=7$, $n_2=29$, $p=0.04$) and between 51-60/41-50 ($n_1=7$, $n_2=5$, $p=0.03$).

On “Set up keep-up-to-date services via the library website”, $H(5)=13.814$, $p<0.001$, where the 41-50 group again had the highest mean rank, there were significant pairwise differences between the 51-60 group and 3 others: 31-40 ($n_1=7$, $n_2=29$, $p<0.001$), 21-30 ($n_1=7$, $n_2=23$, adjusted $p<0.001$) and 41-50 ($n_1=7$, $n_2=5$, $p=0.02$).

Gender and use of Services

Table 120 Appendix15 shows that there was no significant overall gender difference on the use of any of the six library services.

Position and use of Services

Table 121 Appendix15 details significant overall differences for all services among the position groups. However, there were no significant pairwise differences (adjusted $p>0.05$) for half of them, namely “Access links related to keep-up-to-date services”, “Set up keep-up-to-date services via the library website” and “Communicate with the library about keep-up-to-date services”.

“Access links related to keep-up-to-date services” position group was a significant ($H(7)=14.662$, $p=0.02$), “Set up keep-up-to-date services via the library website” the results was significantly difference ($H(7)=14.499$, $p=0.02$) and “Communicate with the library about keep-up-to-date services” ($H(7)=14.587$, $p=0.02$).

On “Help and support about keep-up-to-date services”, there was a significant overall differences between position groups $H(7)=14.577$, $p=0.02$. A significant pairwise difference between PhD students and Research associates ($n_1=31$, $n_2=19$, $p=0.02$) and the latter were most likely to use this service.

On “Library service desk to enquiries about keeping up to date”, there was a significant overall between position groups $H(7)=22.248$, $p<0.001$. Research associates were again most likely to use this service and two other groups had significant pairwise differences with them

in using this service: Professors ($n_1=4$, $n_2=19$, $p=0.02$) and PhD students ($n_1=31$, $n_2=19$, $p<0.001$).

Similarly, on “Finding support from the library when needed” there was a significant overall differences $H(7)=16.559$, $p=0.01$ and a significant pairwise difference between PhD students and Research associates ($n_1=31$, $n_2=19$, $p=0.01$) Table 54, the latter again being most likely to use this service.

Faculty and use of Services

As Table 122 Appendix15 shows, there were no significant differences among faculty groups in the use of these university library services.

Although the analysis in this section is based on a limited number of responses, the results show that staff and PhD students had limited interactions with the library and generally made little use of its KUTD services.

When asked whether a number of training and support options would improve their KUTD ability, participants responded negatively more often than positively to three suggestions, for training sessions on KUTD tools and services, tailored support from a librarian with expertise in KUTD services and support to use specific KUTD methods such as alert services Table 55 Appendix15. However, the 42.5% of positive responses to the first of these options is consistent with the 44% who replied that they would attend a KUTD session.

6.9 Canonical Correlation Analysis

The analysis in the last section focused on identifying the factors that most affected usage of KUTD methods and library services. It considered the low level of individual KUTD methods usage to determine whether the use of any of them was affected by demographic factors. For example, the Academic Tools (AT) group consists of three individual methods, namely using academic databases or bibliographies, academic sharing websites and professional associations. Analysis of all 26 individual methods comprising the eight groups shows that some of these methods were indeed affected by demographic factors. The results showed which of the demographic factors used each method to what extent reflecting usage at the low level of individual methods. At the higher level of analysis the eight groups of KUTD methods (AT, AS, PE, LS, SM, CS, MM and OS), each of which had a higher level of usage than any of its component methods, were subjected to canonical correlation analysis (CCA).

The aim of CCA is to investigate all of the possible relationships between multiple variables at the same time. The main interest of the current research is in whether there are relationships between demographic factors or measurable variables and KUTD methods; CCA is appropriate because of the existence of many independent and dependent variables. In addition, CCA is especially good at representing reality in studies of human behaviour, which tend to involve variables with multiple causes and effects (Sherry and Henson, 2005). The present research investigates many causes and effects of the use of different KUTD methods, so CCA is the right choice of analytical approach. According to Sherry and Henson (2005), it is important to have congruence between the nature of a problem and the statistical methods chosen to analyse the data, especially given the complexity of personality research constructs.

Two CCA tests were run in this research, each involving two sets of variables. The first set in the first test comprised the independent variables, namely age, gender, position and experience, i.e. all of the demographic factors except faculty, which is not a scale variable and is thus unsuitable for CCA. In the second test, the first set comprised the measurable variables of importance, difficulty and ability. In both tests, the second set included all of the dependent or covariant variables, namely the 8 groups of KUTD methods. The first set can be described as the predictor set and the other as the criterion set. Each can include more than one variable and several of either type can be combined into one synthetic or latent variable

(Poddar and Ruthven, 2010), by applying a linear equation in CCA. Thus, predictor variables combine to form a single synthetic predictor variable, while applying a linear equation to observed dependent variables creates a single synthetic criterion variable (Sherry and Henson, 2005). CCA works by examining the correlation between these two synthetics, which depends on the relationships between the variables themselves. It does this by calculating the Pearson r correlation coefficient between synthetic variables (Sherry and Henson, 2005) Figure 23.

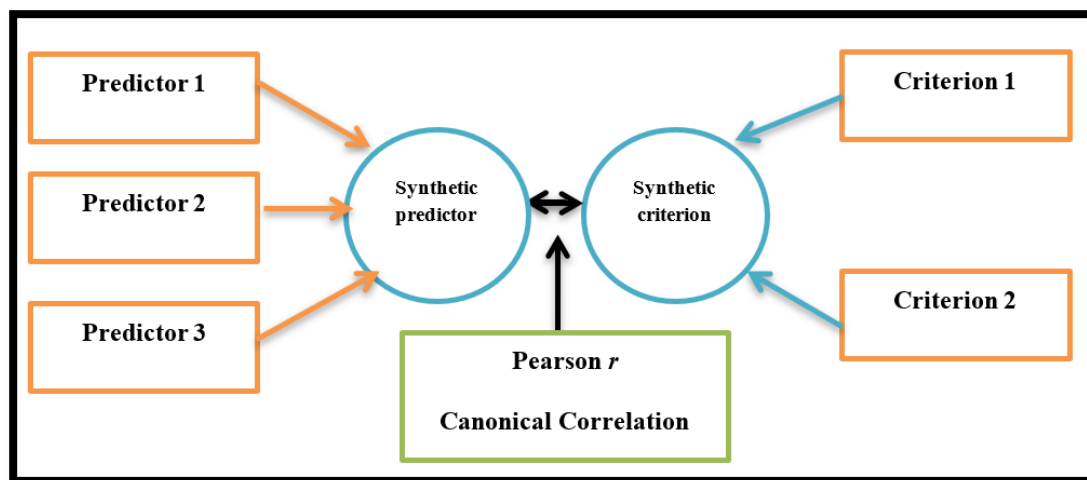


Figure 23: Illustration of How CCA Works with three Predictors and two Criterion Variables (Sherry and Henson, 2005)

The main advantage of CCA is that it reduces the risk of committing a Type I error, which is the identification of a statistically significant result which does not exist (Sherry and Henson, 2005). It does this by exploring all possible correlations between the 2 sets without performing multiple statistical tests.

The following table defines a number of key terms to allow the researcher to convey a clear understanding of the CCA statistical results.

Terms	Definitions
Canonical function	A set of standardised canonical function coefficients resulting from two linear equations. There is one function for each variable in the smaller set. All functions are orthogonal to each other, so sets of synthetic and criterion predictors are all uncorrelated with other synthetic and criterion variables (Sherry and Henson, 2005).
Canonical correlation coefficient (R_c)	The Pearson's r between two synthetic variables, which ranges from 0 to +1 (Sherry and Henson, 2005).
Squared canonical correlation (R_c^2)	The square of R_c , quantifying the variance shared between the variable sets (Sherry and Henson, 2005).
Structure coefficient (r_s)	The bivariate correlation (in CCA, Pearson's r) between an observed (predictor) variable and a synthetic one (Sherry and Henson, 2005). It indicates the usefulness of each observed variable in constructing the synthetic variable (Poddar and Ruthven, 2010).
Squared canonical structure coefficient (r_s^2)	The square of the structure coefficient.
Canonical communality coefficient (h^2)	The sum of r_s^2 across all functions in a particular analysis. It measures the usefulness of an observed variable to the analysis as a whole (Poddar and Ruthven, 2010).

Table 24: CCA Terms

The results of the CCA are displayed in Appendix 16 in multiple SPSS tables, some of which have been combined to create separate tables for tests 1 and 2. Additional calculations to determine the values of r_s^2 and h^2 result in the production of Tables 25 and 26 tabulating the demographic factors and measurable variables (importance, difficulty and ability) respectively, along with the eight KUTD methods in both.

6.9.1 Test one

Table 24 is the abstract table for test 1, listing the four demographic scale variables and the KUTD methods in column 1, followed by 3 columns each for functions 1 and 2. The figures in the first of these, headed Coef, are the standardized canonical coefficients for covariates taken from Table 128 in Appendix 16. The values in the following column, r_s , are taken from Table 129 in Appendix 16, listing correlations between dependent and canonical variables. The r_s^2 numbers in the fourth and seventh columns of Table 25 are derived by expressing the square of r_s as a percentage, while the h^2 values in the eighth column represent the sum of the r_s^2 values for the 2 functions. Finally, separating the figures for demographic variables from those for KUTD methods is a row headed R_c^2 , showing the squared canonical correlation for each function in the r_s^2 column. These values, taken from Table 124 in Appendix 16

(Eigenvalues and canonical correlations), are again expressed as percentages. Thus, for example, the figure of .24304 from the Sq. Cor column in Table 124 in Appendix 16 is multiplied by 100, yielding the value of 24.30% shown in Table 26 (row 7, column 4).

Function 1				Function 2			h^2 (%)
Variable	Coef	r_s	r_s^2 (%)	Coef	r_s	r_s^2 (%)	
Age	0.503	-0.400	16.02	0.379	0.431	18.60	34.62
Gender	-0.099	-0.101	1.024	0.498	0.510	26.02	27.04
Experience	-0.309	-0.593	35.13	-0.815	-0.058	33.73	68.86
Position	1.142	0.891	79.32	-0.316	-0.343	11.80	91.12
R_c^2			24.30			12.71	
AT	0.059	-0.064	0.404	-0.567	-0.4809	23.04	23.44
AS	-0.649	-0.32615	10.63	0.627	0.172	2.945	13.57
PE	-0.615	-0.451	20.92	0.108	0.173	2.992	23.91
LS	0.547	0.505	25.53	0.459	0.482	23.24	48.77
SM	0.21655	0.164	2.703	0.477	0.459	21.04	23.74
CS	0.44912	-0.098	0.972	-0.595	-0.162	2.619	3.591
MM	0.47408	0.501	25.12	-0.303	-0.215	4.616	29.73
OS	0.014	0.122	1.487	-0.007	0.042	0.174	1.661

Table 25: Canonical Solutions for KUTD Methods and Demographic Factors, Functions 1 and 2

6.9.1.1 Reporting the Results of Test One

The CCA in test 1 yielded a total of four functions with squared canonical correlations (R_c^2) of 0.243, 0.127, 0.067 and 0.038 for each successive function. Collectively, the full model across all functions was statistically significant using Wilks's lambda criterion: $\lambda = 0.592$, $F(32, 606.40) = 2.886$, $p < 0.001$. Because λ represent the variance unexplained by the model, $1-\lambda$ yields the full model effect size in the r^2 metric. Thus, for the set of four canonical functions, the r^2 type effect size was 0.472 for function 1 and 0.217 for function 2, which indicates that the full model explained a substantial portion, about 45% and 25% respectively, of the variance shared between the variable sets. As well as the full model, functions 1 to 4 and 2 to 4 were also statistically significant, $F(32, 606.40) = 2.886$, $p < 0.001$ and $F(21, 474.34) = 2.007$, $p < 0.01$ respectively. Functions 3 and 4 (the only functions that were tested in isolation) did not explain a statistically significant amount of shared variance between the variable sets: $F(12, 332.00) = 1.541$, $p = 0.108$ for function 3; $F(5, 167.00) = 1.320$, $p = 0.258$ for function 4.

Given the R_c^2 effects for each function, only the first two functions were considered noteworthy in the context of this research (24.30% and 12.71% of shared variance

respectively). The last two functions explained only 67.28% and 38.03% respectively of the remaining variance in the variable sets after the extraction of the prior functions.

6.9.1.2 Interpreting the Results of Test One

In order to interpret the results, it is necessary to identify the main components in Table 25, which is done by determining which of them have coef or r_s values greater than 0.05. It is also important to consider the sign (+ or -) of r_s and the data input, to determine whether a variable decreases or increases, as explained in the following paragraph. If there is (-) next to the figure of the factors or methods in the table, then this means that opposite direction of the data input should be follow.

With regard to function 1 in Table 25, the main factors are position, expert and age, and the main methods are library services (LS), multimedia (MM) and people and event (PE). This means, for example, that:

- If the position is high and experience is longer, then the usage of PE will increase;
- If the position is low and experience is shorter, then the usage of LS and MM will increase.

These results show that in function 1, older people with more experience in senior positions tend to use PE methods more often and LS or MM less often, whereas younger people with less experience in junior positions tend to use LS and MM more often and PE less often.

In function 2, the main factors are experience and gender, while the main methods are academic tools (AT), LS and social media (SM). It can be concluded that males with more experience tend to use AT more often but LS and SM less, whereas females with less experience tend to use LS and SM more and AT less often.

6.9.2 Test Two

Table 26 shows the noteworthy results of test 2, in the same format as for Table 25.

Function 1			
Variable	Coef	r_s	r_s^2 (%)
Importance	0.370	0.576	33.16
Difficulty	0.197	0.458	20.98
Ability	0.764	0.912	83.20
R_c^2			23.94
AT	0.469	0.538	28.95
AS	0.071	0.298	8.920
PE	0.878	0.086	0.731
LS	-0.181	0.041	0.164
SM	-0.147	0.125	1.562
CS	-0.289	0.185	3.411
MM	-0.031	0.193	3.722
OS	0.180	0.334	11.17

Table 26: Canonical Solution for KUTD Methods and Importance, Difficulty and Ability, Function 1

6.9.2.1 Reporting the Results of Test Two

The CCA conducted using the eight KUTD methods as predictors of the three measurable variables (importance, difficulty and ability), to evaluate the multivariate shared relationship between the 2 sets, yielded three functions with successive squared canonical correlations of (R_c^2) 0.239, 0.076 and 0.025. Collectively, the full model across all functions was statistically significant using Wilks's lambda criterion: $\lambda = 0.684$, $F(24, 479.15) = 2.787$, $p < 0.001$. As with test 1, $1-\lambda$ yields the full model effect size in the r^2 metric. Thus, for the set of 3 canonical functions, the r^2 type effect size was 0.315 for function 1 and 0.835 for function 3, which indicates that the full model explained a substantial portion of variance shared between the variable sets, namely about 31% and 83% respectively. As well as the full model, functions 1 to 3 were statistically significant, $F(24, 479.15) = 2.787$, $p < 0.001$. Functions 2 and 3, the only functions that were tested in isolation, did not explain a statistically significant amount of shared variance between the variable sets: $F(14, 332.00) = 1.282$, $p = 0.216$ for function 2; $F(6, 167.00) = 0.716$, $p = 0.637$ for function 3.

Given the R_c^2 effects for each function, only function 1 was considered noteworthy in the context of this research (23.94% of variance). The other two functions explained only 7.6% and 25.08% respectively of the remaining variance in the variable sets after the extraction of the prior functions.

6.9.2.2 Interpreting the Results of Test Two

In conclusion, these results show that people who consider it important to KUTD and believe they have higher ability to do so tend to use academic tools more often.

Table 27 lists the KUTD methods that were found to be most affected by various factors.

Group Name	Methods	Age	Gender	Faculty	Position	Experiences
1-AT3	Professional associations		☺	☺		
2-AJ1	Online table of content	☺		☺	☺	
3-AJ2	Alert services	☺	☺	☺	☺	
4-AS2	Set up feeds for academic databases		☺			
5-PE1	Attend different event	☺		☺	☺	
6-LS1	Ask the library staff				☺	☺
7-LS2	Visit the library or its website		☺		☺	
8-LS3	Scan the library shelves				☺	
9-SM1	Post questions on social networks					☺
10-SM2	Follow certain academics or authors	☺		☺		☺
11-CS1	Cited by Google Scholar	☺		☺		
12-CS2	Use specialised applications to import all cited papers	☺			☺	
13-CS3	Follow references cited in an interesting paper			☺		
14-MM1	Look at technical diagrams		☺	☺	☺	
15-OS1	Search engine websites		☺			
Total		6	6	8	8	3

Table 27: KUTD Methods

Setting up alert services was the KUTD method affected by the largest number of factors (four in total), namely age, gender, faculty and position. Table 27 shows that each of the other methods listed was affected by three, two or only one factor.

It is notable that factor analysis identified four components which influenced the use of KUTD methods, namely AS, PE, SM and LS. The summary in Table 27 confirms most of the FA findings. For example, among the AS methods (TOCs, alert services and feeds for databases), each of which was affected by a different set of factors, the one affected by the largest number was alert services. TOCs were affected by three factors (age, faculty and position), while setting up feeds for different databases was the method in this group whose usage was affected by the smallest number of factors, i.e. gender alone.

With regard to PE, the FA found this group to contain two influencing methods, namely attending events and scanning lists of papers in conferences. Of these, Table 27 shows that only attending events was affected by any of the factors (three in total: age, faculty and position), while the third method, asking colleagues, appears in neither the FA nor the table. The LS group was found to comprise three influencing methods: Asking library staff was affected by position and experience; visiting the library or its website was affected by gender and position; and scanning the library shelves was affected by position only. Finally, SM was shown to consist of four methods: posting questions on social networks, using social media websites to follow certain academics or authors, following the latest research conducted by research groups and following the latest research conducted by significant independent researchers in the field. Table 59 shows that the second of these was affected by three factors (age, faculty and experience), that posting questions on social networks was affected by experience alone and that none of the other SM methods was influenced by any of the demographic factors.

Overall AS, PE, LS and SM and some of its individual methods were found to be the main components of FA and the demographic factor analysis. On the other hand, analysis identified additional methods as being affected by certain factors. Thus, the use of technical diagrams to KUTD was influenced by gender, position and faculty, the last of which also influenced the usage of cited by Google Scholar and following references cited in an interesting paper. Age was also found to affect the use of cited by Google Scholar and the use of specialised applications to import all cited papers, while gender affected the usage of search engine websites and position had an effect on the use of specialised applications to import all cited papers.

In order to analyse high levels of usage of KUTD methods within the groups, CCA was used to identify any differences among groups and to ensure full coverage of all the potential or proven KUTD methods at all levels of usage. The findings also reveal that AT, PE, LS, SM and MM were the methods most strongly affected by demographic factors. The results show that people who thought it is important to KUTD and reported having high ability to do so tended to use AT more often.

6.10 Overview of the Analysis

This section will provide an explanatory and justificatory overview of the chosen methods of analysis and the conduct of various tests in the present research, whose main aim was to identify different KUTD methods. The initial idea of the research was to identify the individual (lower level) KUTD methods, then to use analytical tools to determine which of them were most used. Secondly, the research has investigated (higher level) groups of methods in order to discover which were used to what extent and by whom. Therefore, many types of tests have been used to achieve specific analyses of the data, such as the Mann-Whitney U test, the Kruskal-Wallis test and CCA. In order to answer the research questions, it was necessary to conduct completely different analyses at the two levels. This section describes the various practices that the researcher followed in analysing the data.

When collecting data, the researcher took appropriate measures to ensure an acceptable response rate (Saunders et al., 2012), as discussed in (Section 5.9 Questionnaire Distribution and Section 5.10 Questionnaire Response Rate). It is important to note that the questionnaire was distributed in two stages, through influential people such as vice deans and heads of department, and the University's RDP, which is a development body. This method of distribution made the online questionnaire available to participants for around two months. The researcher also tried to choose a good time to release the questionnaire and used the snowballing technique in distributing the questionnaire and conducting the interviews.

Despite these comprehensive attempts to maximise participation, the response rate was very low for one of the participating schools, namely the Business School. The researcher tried to contact individuals at the School to confirm that they had received the online questionnaire, resulting in the collection of some responses. However, the overall response rate was very low, with a total of only 9 participants. This number was too low to be taken as representative of KUTD in the Business School. The inclusion of data from such a small sample would have

made the results unreliable. Therefore, the researcher decided to exclude Business School responses from the dataset, after ensuring that there were no more data to be collected, which is considered good practice in data analysis (Kwak and Kim, 2017). When data collection reached a point where the response rate was calculated to be acceptable, the researcher stopped collecting data and began the analysis.

Since the data consisted of many different variables and groups of tools, the researcher used factor analysis to identify the most important tools, which was valuable later, when the KUTD methods were clustered into groups. The use of FA is discussed in detail in (Section 6.7 Factor Analysis).

At the next stage, in accordance with accepted good analytical practice (Marange and Qin, 2018), a normality test was conducted to determine whether the data were normally distributed. The results showed that they were not Appendix 13; therefore, they were subjected to the non-parametric Mann-Whitney U and Kruskal-Wallis tests. The purpose of the Mann-Whitney U test was to compare pairs of independent groups, such as males and females, in order to identify any significant differences in their usage of particular KUTD methods (MacFarland and Yates, 2016; Nachar, 2008). As to the Kruskal-Wallis test, this was used to identify statistically significant differences in usage of individual KUTD methods among academic disciplines, age groups, faculties and other demographic categorisations consisting of three or more groups (Ostertagova et al., 2014; McKnight and Najab, 2010). The researcher used these two tests as appropriate to the type of data and the research questions to be answered, and in conformity with their use on similar data in related studies (e.g. Al-Muomen et al., 2012; Restoum, 2016; Al-Daihani, 2003; Ramadoss, 2019). This demonstrates how the researcher followed good practice and engaged in intensive reading to acquire a deep understanding of what types of analysis and test were most appropriate and why.

The research identified a total of 26 KUTD methods and many independent groups defined by demographic factors. Since the purpose of the analysis focus was to identify and quantify differences among these groups, it was appropriate to use pairwise comparisons, a method of analysis dealing with multiple population means in pairs. Post hoc tests were used to measure the differences between the means of two groups. Some of the results were highly significant, while others were significant but close to 0.05; therefore, the researcher decided to follow recognised practice in using the post hoc (Bonferroni correction) in order to reduce the chances of obtaining false positive results (type I errors) (Pearn et al., 2018; Lin and Pearn, 193

2011). This procedure reduces p-values when multiple pairwise tests are performed on a single dataset. The p-values of all pairwise comparisons reported in this research have been Bonferroni adjusted.

In order to evaluate numerous entities and choose the best one, multiple testing is necessary, but this can result in an unacceptable number of type I errors (Pearn et al., 2018). This problem of error inflation can be addressed in practice by the Bonferroni method (Lin and Pearn, 2011), which is commonly adopted experimentally, e.g. when comparing multiple groups to baseline or examining relationships among attributes (Armstrong, 2014). It works by dividing p-values by the total number of tests conducted, in order to keep type I errors at an acceptable level whenever multiple tests are needed (Gelman et al., 2012; Pearn et al., 2018).

After conducting the Mann-Whitney and Kruskal-Wallis tests and obtaining the significant results required to answer the research questions, the researcher decided to stop the analysis, as there was no need for any further analysis related to individual KUTD methods (Bastardi et al., 2011); again, this is considered good practice in data analysis (Nosek et al., 2012).

Finally, CCA was conducted to identify groups of KUTD methods, as detailed in (Section 6.9 Canonical Correlation Analysis). CCA is used to investigate all of the possible relationships between multiple dependent and independent variables at the same time. It was deemed appropriate in the present research because of the need to explore the potential relationships between the many demographic and other quantifiable variables on one hand and the usage of KUTD methods on the other. Sherry and Henson (2005) describe CCA as a particularly valuable tool in human behavioural research, where variables often have multiple causes and effects, as is the case in the current study. Here and throughout this section, a sound justification has been advanced for the appropriateness of the analytical choices made in pursuit of answers to the research questions.

6.11 Summary

This chapter has reported on the descriptive analysis, sample distribution and response rate. It has explained the use of a normality test to check the distribution of the data and of factor analysis to reduce the number of KUTD methods to a manageable size.

Other analysis results reported here include the task for which KUTD practice was most needed, which was research, and how many participants were willing to attend KUTD

training sessions. The main obstacle to KUTD was lack of time and the final finding is that participants' interactions with the library KUTD services were not very strong.

This chapter also provides good evidence about which KUTD methods have been used the most. The analysis shows that demographic factors such as age, gender, academic position and length of experience affected the use of different KUTD methods (at the higher level), as did participants' perceptions of the importance or difficulty of KUTD.

Chapter 7: Factors motivating the usage by Staff and PhD Students of KUTD Methods

7.1 Introduction

This chapter concerns the face-to-face semi-structured interviews conducted with a total of 29 members of staff and PhD students from all four faculties: Engineering, HASS, Science and Business. Thus, a total of 30 face-to-face semi-structured interviews were conducted in the current research.

Interviews were used here to complement the questionnaire by investigating the factors behind the use of different KUTD methods. In addition, interviews can explore the real situation and reflect participants' perspectives on the role of university and the library in keeping them updated. In reporting and discussing the interview response the chapter aims to answer the following questions:

- How important is it for staff and PhD students to KUTD?
- Why do staff and PhD students use or not use a particular method?
- What are the factors or motivations behind the usage of particular methods?
- How can the university help staff and PhD students to KUTD?
- How can the library help staff and PhD students to KUTD?

The chapter will also discuss participants' responses to all of the open-ended questionnaire items and considers the results in the interview analysis, under similar topics or issues. These questionnaire items are Q8, Q14, Q15 and Q24, further details which are given later in the chapter. There are also, sections on the data were collected, sampling, on the interview procedure and protocol and finally on interview analysis.

7.2 Data Collection

Interviews were conducted throughout January and February 2017, to ensure that relatively little time elapsed between the administration of the questionnaire and the interviews. The online questionnaire was closed at the end of November 2016, allowing participants' time to

refresh their memories and gather their thoughts in order to provide in-depth justifications of their questionnaire responses. The interview protocol, will be discussed in (Section 7.6) shows the close relation of some questions with questionnaire items. Standardised open-ended questions were put to all participants, in order to elicit comprehensive data showing similarities and differences among interviewees and the reasons for these (Pickard, 2013). Follow-up questions were used to generate further data if clarification was needed.

Each session lasted approximately 45 to 60 minutes and was audio recorded via an iPhone application. A departmental common room was booked in advance, but not all interviews were held there, as some participants preferred to meet in their own offices or departments.

7.3 Sample

Two sampling methods were used. First, questionnaire participants were invited to volunteer for interview by providing their email addresses. The snowballing technique was then applied at the end of each interview, when interviewees were asked to recommend any colleagues, supervisors or fellow students who might be interested in participating. With the permission of the recommended person, the interviewee would provide contact details so that an interview invitation could be sent. The volunteering and snowballing methods were adopted because staff and PhD students were expected to be very busy, making it essential to identify people whose strong interest in KUTD would make them willing to invest time and effort in deepening the understanding of this topic. Some were expected to feel that they had weak knowledge of KUTD techniques and wished to improve their own understanding and effectiveness, while others who were confident in their ability to KUTD would be willing to share their ideas and knowledge. This contrast within the sample would facilitate a comparative analysis of successful and unsuccessful KUTD behaviour and the identification of the underlying factors or motivations.

The following tables provide statistical information on the interview sample.

Participant ID	Age (years)	Gender	Experience (years)	Position	Faculty	Word count in word document
P1	31-40	F	1 to < 4	Research Associate	Sciences	7358
P2	31-40	F	1 to < 4	Lecturer	Engineering	6789
P3	31-40	M	4 to < 6	PhD	Sciences	9956
P4	21-30	M	1 to < 4	PhD	Engineering	6929
P5	21-30	M	1 to < 4	PhD	Engineering	4966
P6	41-50	M	4 to < 6	Professor	HASS	7969
P7	21-30	F	< 1	PhD	Business	3213
P8	21-30	M	< 1	PhD	Sciences	6239
P9	31-40	F	< 1	PhD	Engineering	8563
P10	31-40	M	< 1	Lecturer	Sciences	7960
P11	31-40	F	< 1	Lecturer	Sciences	11258
P12	21-30	F	< 1	PhD	Sciences	6240
P13	21-30	M	6 to < 10	PhD	HASS	9887
P14	21-30	M	4 to < 6	PhD	Sciences	2906
P15	31-40	F	1 to < 4	PhD	Engineering	3131
P16	21-30	F	6 to < 10	PhD	Sciences	5104
P17	31-40	F	1 to < 4	PhD	Sciences	6876
P18	31-40	M	< 1	PhD	Engineering	2962
P19	21-30	M	1 to < 4	PhD	Engineering	5276
P20	31-40	M	1 to < 4	Research Association	Sciences	3318
P21	>60	F	10 or more	Professor	Business	10259
P22	51-60	F	10 or more	Professor	HASS	4242
P23	31-40	F	1 to < 4	Research Associate	Sciences	9569
P24	21-30	F	1 to < 4	PhD	Sciences	3758
P25	21-30	M	1 to < 4	PhD	Engineering	5786
P26	31-40	M	10 or more	PhD	Sciences	7405
P27	31-40	M	4 to < 6	Research Associate	Sciences	5053
P28	51-60	M	6 to < 10	Professor	HASS	6411
P29	31-40	M	6 to < 10	PhD	Sciences	3870

Table 28: Interview Participants

Age		Gender		Experience (years)		Faculty	Positions			
							Professor	Lecturer	Research associate	PhD students
21-30	11	Male	13	< 1	7					
31-40	14	Female	16	1 to < 4	11	Engineering		1		7
41-50	1			4 to < 6	4	Science		2	4	9
51-60	2			6 to < 10	4	Business	1			1
>60	1			10 or more	3	HASS	3			1
Total	29		29		29	Total = 29	4	3	4	18

Table 29: Demographic Distribution of Respondents

7.4 Pilot Interview Study

A pilot set of four interviews with members of the department was conducted in order to establish the timing and for the researcher to practice the skills and techniques needed to ask questions without making interviewees feel uncomfortable. Feedback from participants helped to improve the flow of the questions and to ensure that they were clear and easy to understand.

7.5 Interview Procedure

Ethical approval was obtained from the Departmental Ethics Committee, then personalized emails were sent to participants inviting them to choose times and dates to suit their availability Appendix 18. They also received a sheet of important information about the research and consent form Appendix 21, 22. After a week, a polite reminder was sent to anyone who had not yet replied to the initial email, asking if they would still like to be interviewed Appendix 19, 20.

The researcher began each interview by welcoming the participant warmly, to create a friendly atmosphere and make them feel comfortable, encouraging them to ask questions about the interview or any related issues. The researcher briefly outlined the present research and the conduct of the interviews, then defined KUTD to ensure that participants understood the topic. Each participant was asked to sign a consent form agreeing to the interview and to the session being recorded. Next, the researcher asked the interviewee what research they were doing or what academic post they held and how their day had been, then explained the interview protocol and what questions would be asked. The researcher made them aware that all interview data would be anonymous, as each participant would have an ID number that would be used in any publication.

During the interviews the researcher applied the techniques the researcher had learned, by interacting with participants as an active listener, paraphrasing and clarifying where needed and using body language to encourage participants to provide more details.

The Voice Memos app was used to record the interviews. After the interviews, the audio files were transcribed and saved as Word files.

7.6 Interview Protocol

Details of the interview protocol are given in Appendix 17. After the introductory exchanges, participants were asked what they thought about KUTD and its importance for them. The researcher then showed them a table of KUTD methods and explained how the questions would relate to it. For each group of methods, the researcher next asked whether they used it or not and why. In order to understand their KUTD behaviour, it was very important to ask participants about the factors or motivations behind their use or non-use of particular methods. The focus then shifted to the institution and its role in helping participants to KUTD. They were asked how the university or department kept them updated, then how the university library helped them to KUTD.

At the end of the interviews, participants were asked to add any final thoughts, comments or suggestions related to KUTD. After inviting them to recommend other participants, the researcher thanked them for their time and effort.

7.7 Interview Analysis

The choice of qualitative analysis method usually depends on the research questions, the nature of the research and the topic, so there is no fixed set of rules to follow in analysing qualitative data (Saunders et al., 2012).

Once the interview recordings had been transcribed, the data was subjected to several stages of analysis. The first was to read through each document in order to understand it and to outline related ideas, because participants may have mentioned the same ideas on different occasions. The second stage was to identify themes and to determine their frequency of occurrence. Next, groups of themes were allocated codes. Going through these stages provided a broad picture of the data and determined which type of analysis should be applied. An overview of the data revealed that there were no discernible general trends in the KUTD methods adopted by groups of users; for example, it was not possible to identify ways to KUTD commonly recognised as superior, since each individual had his own ways of doing so. Thus, there appeared to be no general trends in the use of individual methods or in factors affecting their use. Therefore, the analysis applied to the interview data was descriptive, with the aims of identifying the main themes and issues and of revealing the similarities and differences between participants, so as to draw conclusions reflecting a participant-centred

perspective on KUTD. An example may help to clarify the procedures followed in interview analysis to identify each main theme, its categories and subcategories, and to assign final codes. One of the main themes emerging from the interviews was methods used to KUTD and another was methods that were not used, which led the researcher to identify obstacles to the use of methods as a category. These obstacles could then be divided into three main subcategories, corresponding to things that participants mentioned as affecting their usage of particular methods. These subcategories, namely lack of time, lack of awareness and information overload, were then assigned the identifying codes shown in Table below.

Subcategory	Code
Lack of time	1LT
Lack of awareness	2LA
Information overload	3IO

The number before each code indicates the ranking of obstacles by frequency of occurrence in the transcripts; thus, the obstacle most often mentioned was lack of time and the next was lack of awareness. The whole corpus of interview data was subjected to the same procedure in order to generate a consistent set of categories, subcategories and codes.

As to the selection of extracts used as evidence, these were chosen as representing the strongest opinions, most clearly expressed and covering as many as possible of the different aspects of a question or issue that had been discussed. Although not all of the demographic factors were found to have a significant effect on the use of KUTD methods, the position of each participant is stated under each quote in order to reflect the variety of answers given and to demonstrate that all groups of participants have been represented. Moreover, participants' position was found to have an effect on the number of methods, which makes it the factor having the strongest effect. This also allows the analysis to focus on the methods more than on the factors. Table 28 provides full details of each participant as a reference.

7.7.1 Importance of KUTD

Participants acknowledge the importance of keeping up to date with developments in their field.

P3: Yeah, I think it's absolutely critical. Like I say, to me, keeping up to date means giving you an edge. And I think it's extremely important for sure (PhD Student).

P20: It is very important to write. So for me, I think it enhances the quality of your investigation. Even doing the same experiments or whatever, because you know you can write more accurately, and you know more interesting things (Research Association).

Several participants considered it important for academics to KUTD with developments, either for academic reasons or PhD studies.

P2: I'm a lecturer and academic, so I have to keep track of what publications and what research is ongoing both in terms of journals, so more verified work, and more concepts and conferences for my own research (Lecturer).

Staff and PhD students gave many different reasons for seeing it as important to KUTD, including the rapid increase in the amount of published information, the need to speak authoritatively about changes or developments in a given field, knowing what other people in the field are doing and contributing to knowledge.

P11: I think a lot of the fields change quite readily and I realised there's been so many advances since then. I don't know if I can speak authoritatively in this way unless I've looked at newer things (Lecturer).

P14: Because you need to know what's going on in your field. In a PhD you have to make contributions. You need to do something that no one has done before, so by keeping up to date you can make sure you are on the right track (PhD).

It is noticeable that most of the participants working in multidisciplinary areas cared more about KUTD than those working in well-established fields.

P23: Yes, I think so, particularly if you are inter-disciplinary. Because I applied for this job because I really liked the project, rather than I see myself changing field. So I want to keep updated on what's happening, in what I would think of as my home discipline, and I also want to keep up to date in things where there might be crossovers or opportunities. So yes, definitely it is important (Research Associate).

KUTD was also seen to be particularly important in fields where the rate of change was relatively high.

Some other contributors recognised the need to KUTD in principle, but gave contrasting reasons for not doing so rigorously in practice. Thus, in a very rapidly changing field it may be very challenging to keep abreast of all changes and more appropriate to concentrate on one's own innovations, while certain other fields conversely undergo such slow internal change that it is better to focus on awareness of developments in public and government policy.

P3: Which I think that's partly due to the fact that computer science is so quick. The speed of progress for us is usually far faster than other fields. So keeping up to date is often seen as being impossible. So we have this sort of compromise. We try and keep up to date but we also try and just do things ourselves because we sort of accept that whatever that standard solution is now, it's going to be out of date by the time we implement it in a few weeks, or months or whatever (PhD Student).

P28: the right answer is that it's important to keep up to date. Mostly I don't find it's that important, I think because the areas in which I work don't change very much and so you'll get a big breakthrough or a big kind of shift in thinking every decade or every fifteen years or something and then everybody knows about it

so it's not like it's not like medicine or the sciences or that sort of stuff where there is a continuing unrolling of knowledge (Professor).

Overall, the results show that a majority of participants considered it crucial to KUTD, a finding that is consistent with the questionnaire results. Staff members KUTD for many different reasons, whereas students mostly did so to establish whether anyone else was working on the same research topic. Finally, speed of change appeared to affect participants' KUTD behaviour.

7.7.2 Analysis of KUTD Methods

7.7.2.1 Academic Tools

In general, participants recognised the benefits of using AT as a way to KUTD, noting that the types of sources used can ensure the provision of updated academic information, which will also be reliable and accessible.

P 24: I think academic tools, because they're always kind of easy to trust. It's always from a legitimate source. And because it's relatively easy to access them through the library. So it's pretty easy that way to kind of keep on top of things. Also, the reliability. You know it's going to be good quality. That's definitely a good thing (PhD Student).

Participants in senior positions tended to evaluate professional associations and databases more highly as tools to KUTD, whereas junior participants preferred GS and RG. Staff such as two of professors and a research associate did use RG, but mostly for self-promotion and to allow others to access their work.

P22: Professional associations would be quite important, because that's where the government quasi-policies are. I use it more as a parallel to research, looking for things like impact and issues like that (Professor).

Most interviewees treated GS as an AT tool, even though in the questionnaire it was classified under 'other sources' with all types of search engine. In general, participants used databases and GS, but the juniors tended to depend more on GS and it still very common tool among all participants. Users reported that GS gave them full coverage in terms of different formats of information sources and topics, that it was fast, easy to use and accessible and that it provided relatively legitimate sources.

P2: Because to me they're duplicated with everything else. I go to Google Scholar. It pulls from all the papers. So Science Direct, Web of Science are just a subset of doing a global search. Why would I only search four journals when I can search all of them? I use Google Scholar most of the time because it's the broadest reach and the easiest one to use. And it pulls from all of these sources (Lecturer).

In addition, some participants mentioned using set-up alerts and checking “Cited By” of GS to keep themselves abreast of the latest developments.

P11: Google Scholar is for more general types of searching that might be in broader areas. But I use the Cited By link to take me to what they’ve cited, and I go forward in time, and that’s actually some of the best ways to KUTD (Lecturer).

P4: With Google Scholar I just select some research terms and it updates once a week, I think and I get some just very overall e-mails, with information on three different fields (PhD Student).

Interviewees also explained how subject databases could be used to provide more focused, relevant and up-to-date information.

P11: I find that I tend to do a lot more advanced searching. That’s how I tend to use the LISTA database. I’ll do advanced searching in there using subject headings and really kind of in-depth searches, which does get me up-to-date information. I will often limit it by date as well. What I tend to use Google Scholar for more is more general types of searching that might be in broader areas (Lecturer).

RG is a tool that allows younger participants to communicate with professionals, ask questions, download and subscribe to articles, as well as receiving comments and feedback. On the other hand, professors tended to use RG to advertise their work and allow people to access the full text of their papers.

P19: Research Gate. You can have more active participation. When you ask a question to people in your community, people usually get back to you (PhD Student).

P28: I’m on both Research Gate and Academia, but I’m more a producer than a consumer in those kinds of places, so it is probably the primary way that other people access my work (Professor).

On many different occasions, participants made explicit some of the difficulties that they faced when using academic tools, such as information overload, receiving irrelevant information and difficulty in searching and navigating some AT websites. The majority of these participants were PhD students and minority in higher positions.

P6: Well, I think about ten years ago, there were far fewer databases and source and the ones that existed were far more thorough. Now there are dozens and dozens of databases. And they are incomplete, and they are difficult to use. And some of them, the search terms and they dip in and out of different fields (Professor).

7.7.2.2 People and Event (PE)

Interacting with people is considered one of the most important ways to KUTD with developments. Most participants stressed the importance of attending conferences and workshops and asking colleagues. Conferences provide many different opportunities for staff and PhD students to KUTD, by exchanging information and knowledge, quickly accessing current information and new ideas from specialists, connecting with people, building

networks and being open to collaboration. The following responses illustrate a number of advantages of PE as a way to KUTD that participants acknowledged:

P11: Making a personal network and widening your network, and that's a really good way to kind of see who's in the field, and who's doing what. And it's broader than just keeping up to date, but that's part of it. It's being a part of a community and kind of getting an understanding of what the community does and how it works (Lecturer).

While the advantages of PE as a way to KUTD were seen to outweigh its disadvantages, participants did acknowledge that attending conferences required planning and that claiming expenses, for example, could be time consuming.

P10: It's a really, really torturous process to speak to my head of my department to try and get eighty pounds for my train fare once a year to go to a conference. It should not be that difficult. There should be a better mechanism for people in my job family to travel to external events (Lecturer).

Other disadvantages mentioned were that finding relevant information at occasional events can be a matter of chance, that conference attendees will represent only a partial slice of any field and that information gathered there may be inaccurate or outdated because people can be biased towards a particular method, approach, author or university. Most of the obstacles were faced predominantly by students and by very few staff members.

P25: I suppose it reflects the view of a select group of people within that community. So it can become, I guess, an echo chamber. This is true of academic papers as well, but there's a sort of self-selection thing, that the people who go there generally will tend to have similar backgrounds, understand similar elements of things, and share the same opinions, broadly speaking. So if you want to look at yeah, that's a disadvantage (PhD).

7.7.2.3 Library Services (LS)

With regard to library services, which include visiting the library, seeking the librarian's help and using the library website, participants reported rarely visiting the library or seeking the librarian's help.

P22: Well, I don't visit the library staff, and I don't go and scan the library shelves. I'll look at particular journals online. I'm a member of research associations that send me the journals. So I don't need to go to the library. If I find useful journals on particular subjects, special issues or particular things, I would access them electronically rather than going to the library (Professor).

Participants tend not to seek the librarian's help, preferring to search for needed information they needed by themselves, and justified this by saying that they could work in interdisciplinary or covered many different areas at the same time and librarians would not be able provide this relevant information.

P28: Well, they would need to make a connection between a completely unrelated area and bring that to me because that's the way that I work and they're never going to do that (Professor).

In general, participants reported low usage of library KUTD services and among the reasons they gave were that they saw the library as serving undergraduates only or as providing mostly general information and, in some cases that they were not aware of any KUTD services that the library provided.

P10: To be honest, I'm unaware of the services as they currently exist. I find it hard to imagine that the university's library would have something (Lecturer).

Many participants, however, acknowledged that access to information sources was provided by the library and this was the main advantage of the library services.

P20: I think it is a very, very good opportunity. I feel lucky to be able to access those articles that are not open access. The accessibility to information that would otherwise be impossible to access to these sources of information (Research Association).

7.7.2.4 Social Media (SM)

Social media usage was generally low among both staff and PhD students. Professors tended to rely on their personal connections to KUTD and those aged 40 and over did not use SM for this. Participants with high SM usage were mostly younger, particularly in the 31-40 age group, and tended to be studying or working in inter-disciplinary ways; alternatively, they were in fields that were rapidly changing or whose nature supported SM usage.

In terms of the advantages of SM as a way to KUTD, participants mentioned the building of connections, openness to future collaboration and advertising research work.

P3: I find that social media, particularly Twitter, are utterly invaluable. The reason I started using it was because the people that I wanted to collaborate with seemed to be using it all the time. So for me that's one of the ways that I keep in touch with other people for keeping up to date, for sure. The information there is just up to date, and because I'm following the people that I want to follow, it does exactly what I wish (PhD Student).

Others stated that SM could keep them abreast of news, providing general information on communities, conferences and academic events.

P1: Well, it's really, really, I mean that was also another kind of major breakthrough of the last few years. First of all you hear about news, like new conferences, calls for papers, sometimes job adverts that you might not actually get to see or they might not come to your mailbox or. Also sometimes you can mobilise other users or colleagues if you have a question, for example, and you want to find answers, you can kind of interact with the online communities, say "Okay, this is what I'm researching, do you have any resources on that?" or "Have you worked on that?". Yes, also a lot of information which, you know, kind of comes to you in a very nice, once again, practical way (Research Associate).

P10: Social media is the main tool to measure the pulse of that community. So I follow a number of high profile individuals. And they regularly re-post interesting articles. I also through social media have discovered blogs and websites, other places people are writing their own reviews (Lecturer).

A few participants considered SM the best and fastest way to KUTD with developments.

P23: I love social media. I think it's one of the best ways to keep you updated. I just had an article come out this morning, so I've put it on Twitter, and then you get everybody else to tweet it for you. I know who I'm interested in and what fields they're working in and everybody puts their new stuff on Twitter. So I just sit in my office and it comes into my inbox and it's just a really easy way to keep particularly when you're thinking about keeping up to date with what's new and what's current. Yes, I like it. It's also just like as you become more established in your field, you get lots of connections with people working on the same things (Research Associate).

As to its disadvantages as a way to KUTD, many participants acknowledged that SM can be very distracting and can thus waste time. Other disadvantages were that SM can include irrelevant information, with the risk of information overload, and that it concentrates more on personal and social matters than on academic material.

P6: It's not something I actively do, it's more of a time waster than a productive, I don't see it as particularly productive. But if I see something that comes across when I'm waiting for the train then I might look at it. But yeah, I don't use it that much for finding out about what's going on (Professor).

7.7.2.5 Alert Services (AS)

Only a few participants had a high usage of AS and reported that it had become a habit or a routine for keeping up to date.

P12: Yes. I do find that very useful, because as I said, I work in different departments, and at times I'm focusing on one subject and not thinking about the other subject much. But when there's an alert service, especially when there is a new paper or something like that. It's like an uninterrupted routine. I don't have to pull it. It will tell me I need to pay attention now. So I think that's great (PhD Student).

Participants acknowledged a number of advantages of using AS to KUTD, such as its automated nature, prompt updating with new material and the ability for the user to set the desired timelines.

P4: Okay. It's just the automation aspect in it. I don't have to remember to go and do stuff. It updates me as soon as new developments arrive in the field. And because once it's automatic so that makes it a bit faster, a bit more effective. And I only choose things within my field as well, so I don't have to go through a lot of other stuff which isn't particularly relevant for me. So it's less distracting (PhD Student).

Most participants, however, either did not use AS methods or did so only occasionally, considering this to be a secondary and passive way to KUTD.

P2: I don't tend to depend on the alert services. It's a more secondary, passive means of keeping track of it. So I'll use it as a failsafe to just verify sometimes if there's other journals, or sometimes it comes up with alerts that may or may not have something to do with the research, depending on how well I enter keywords (Lecturer).

The main reasons for the low usage of AS appeared to be information overload, the delivery of irrelevant material and the difficulties that participants experienced with keywords and terminology during the setting-up process.

P6: I think the disadvantages if that you're getting a lot of stuff all the time (Professor).

P10: I feel that alert services and keyword searches, citation searches, always have the capacity to miss something out if it's worded differently, or if it doesn't cite this paper. Or if some filter doesn't work. Now if I start looking at the wider field, maybe I'll use those tools to kind of pick out something from the wider field. But because, I mean, I think on average it's only one or two articles per day. I can sit down for ten minutes on a Monday morning and skim the headlines and put any aside for reading later, so I can still do that manual filtering because my field is so specialised. If I was reading a big journal, I would be doing that keyword searching informally by skimming through the titles and looking for "carbon" or "silicon" (Lecturer).

In addition, some participants acknowledged that they tended not to rely on AS to KUTD because it depends on an algorithm and recommendations.

P1: I don't over-rely on them. I mean, it's just an algorithm doing the work. So you cannot just rely on that for keeping up to date. It's just an additional piece of information coming to you automatically. I mean that's the way I see it at least, So you are not really sure that an algorithm will be able to guess all of your research interests first to give you feedback about things or topics you are interested in (Research Associate).

7.7.2.6 Citation Services (CS)

Participants tended to use citation services more to get a general overview of a particular field. They saw CS as a good indicator of general trends in a field such as by identifying the key authors, references, topics and keywords.

P22: I don't know if it's about keeping updated but it is about being quite nosy. Who's doing work in what, and how work is being used in different contexts. So it's not so much maybe keeping yourself updated, but it is about understanding the breadth of application of, say, a particular methodology or a particular theoretical idea to see the ways in which, the sorts of contexts in which it's being used and applied. I don't know, it's a trackable thing. It's quite an incidental sort of approach. I mean, you could say it's about systematic review (Professor).

CS can be used to KUTD by following forward citations, which would lead to relevant new material, as a number of participants acknowledged.

P25: Just by its very nature, the information you get is going to be more recent than the paper itself, and it's probably going to be related in some way to that. So it's a way of finding more up-to-date research papers that have been published that are relevant to that area of interest that you had (PhD Student).

More than half of participants saw CS as a way to KUTD with no disadvantages, whereas the other half acknowledged a number of drawbacks such as information overload and the fact that the stated number of citations does not reflect the quality of the work or the number of people actually citing a paper.

P6: I don't always trust how accurate it is. Sometimes it leads you to things where you don't really care if it's been cited there and sometimes important citations are missed. So I'm not convinced that they're always accurate (Professor).

7.7.2.7 Multimedia (MM)

A number of participants reported using MM to go beyond obtaining general information or basic knowledge by providing more detailed explanations.

P1: If I want to see something, how it really functions. So a paper is good because it tells you what was found out in the study, but if you want to have a clear idea of how for example a prototype works, or a demo, it might be much better to go and look for a real video of how this thing actually works (Research Associate).

Participants were divided, however, with some saying that they did not use MM at all or that they considered that it was not a good way to KUTD academically.

P22: I listen to audio clips and I will actually watch video clips. I've said I wouldn't watch video clips like TED talks, but I would watch clips of lectures or discussions, I suppose. But I wouldn't look at a TED talk for an academic, but not for keeping me up to date with academic stuff, because it's not academic, so I wouldn't look at it for academic stuff (Professor).

Others gave a number of reasons for tending not to use MM as a KUTD method, for example because they found it time consuming or because they preferred reading over listening to audio material.

P 2: I don't tend to do any of them, mainly because I don't tend to listen to audio. I'm usually reading stuff. So I don't mind reading things. It's just I can read much faster than I can listen to somebody. So if I have to listen to somebody for a thirty minute podcast to get the one minute of information I might have needed, I could just scan through it in less than two minutes (Lecturer).

7.7.2.8 Synthesis

The purpose of the methods question was to discover which methods or tools were the most used and to identify the factors affecting usage.

Responses concerning AT and PE include individuals was distinguished by the fact that participants proffered opinions on individual tools, whereas in the case of other methods they tended to reflect on the group as a whole. This distinction may be explained by the higher usage and greater familiarity of the AT and PE methods. Most participants also treated Google Scholar as belonging to AT, rather than OS, and there was almost no mention of scanning Amazon. AS for AJ tools, these were subsumed under AS in the interview discussion.

AT

The focus on professional associations and databases was stronger among senior positions participants than junior ones, who also differed in their use of RG: students used them to build networks and communicate with key scholars, whereas senior academics were

concerned with promoting their own work. The main reasons given for using AT to KUTD were accessibility, full coverage and reliability.

PE

No particular group, age or faculty was found to have a particular tendency to use PE to KUTD, but senior staff tended to evaluate this group more highly than students and gain more advantage from it. Some staff and PhD students explained that claiming funding, planning journeys and not being able to attend events all the time could be obstacles. On the other hand, students tended to face some difficulties in understanding how to link relevant information and to ignore irrelevant material or understand why it was irrelevant. This inability may be due to a lack of experience and weak understanding of the landscape of the field, or poor judgement of the relevance and interrelatedness of information within the context of the topic in general.

Neither inter-disciplinary nor multidisciplinary focus appeared to affect the use of PE. Similarly, working or studying in a rapidly changing field had no effect. Most participants identified PE as the best way to KUTD, but did not believe that they should rely on it exclusively.

LS

The main reasons given for low usage of library KUTD services were lack of awareness and perceiving the library as a source of general and background information, despite the library providing access to information resources.

SM

Most senior participants tended to rely on personal connections, whereas junior ones and those doing multidisciplinary work were more likely to use SM. However, overall reported usage of SM was low, influenced by factors including information overload, irrelevance, distraction and time.

AS

AS was seen as a secondary, passive KUTD method and usage was low, except by a few staff members. Obstacles again included information overload and irrelevant information, as well as keyword creation.

CS and MM

Participants saw CS as an indicator of general trends in a field, although not all considered it useful for keeping updated. Finally, most participants tended not to use MM and did not consider it a useful KUTD method.

Overall, AT and PE had the highest usage among participants and LS, MM and SM the lowest. The effect of demographic factors was limited to some groups, although PE, AT and SM usage, for example, were affected by age and positions to some extent. Issues identified as affecting the usage of KUTD methods more generally, including the time needed to use them or to set them up, information overload and irrelevance, other factors will be discussed further below.

7.7.3 Motivating Factors

With regard to the different factors that might motivate them to use any particular KUTD method or tool over others, participants made clear on many occasions that they did not know what led them to use particular methods. In addition, they stated that they did not give much thought to how they would KUTD, which methods they used or why.

P4: There's no real deep thinking about why. It's more trying something, see if it works, in which case, yeah, and then keep using that tool (PhD Student).

Participants nevertheless mentioned many factors potentially motivating their use of different methods, such as familiarity with a method or tool, its usability or ease of use, habit, the time needed to set up a tool, full coverage, personal preferences and peer influence.

The influence of peers emerged as the main motivation for using particular methods, where colleagues or peers suggested using particular tools or following certain methods to KUTD.

P25: I just think that most academics or influential people within this field also don't use Twitter, which means that it's not useful, whereas if they did, then I would consider switching to that tool (PhD Student).

P6: Most of it is just down to my own personal experience of using them, but sometimes I will rely on the advice of others (Professor).

In second place was habit, whereby participants became habituated to using particular methods or tools by doing so until they became part of their everyday practice or daily routine.

P21: It could just be this is what I've always done. So this is my habits but I'm open to trying new methods or tools if it works for me (Professor).

P24: Yeah, I think if I just get into the habit of something, I just stick to that (PhD Student).

The third factor was ease of use, meaning the extent to which participants found it easy to navigate or deal with certain tools or methods in order to KUTD.

P23: Keeping up to date thing has to be easy or you're just not going to do it. It just needs to be something that fits in. It needs to be something that is really part of your day to day or something that doesn't annoy me and easy to use it and if it feels like hassle, then not going to use this tool (Research Associate).

Overall, participants mentioned several reasons for using particular methods, some related to personal factors and others to characteristics of the methods or tools. Examples of personal factors were peer influence or colleagues' suggestions, and establishing the habit of using particular tools, while the most strongly motivating aspect of the tools themselves was ease of use.

7.7.4 Role of the University Library

When asked for their views on the role of the University library, the majority of participants stated that it was not responsible for keeping them updated. Some offered detailed reasons for believing that this was their own responsibility, or a joint responsibility, not the library's alone.

P3: I don't think they have to. I think they should be able to, if that makes sense. So I don't think it's their responsibility to keep me up to date. I think that's my responsibility, and I think it should be every student's responsibility (PhD Student).

Others referred to the time required to explain specific needs to the librarian, which might be better spent in conducting their own independent KUTD activities, and to the fact that the library staff would be unable to decide on the relevance of information in each specialised field.

P2: I don't think they'll be able to do much because it's a specialised niche thing, and they're not looking at textbooks, they are basically just looking at the same journal citation search I can do that. If I was looking up something where they have a better expertise than me, then yes, I can see that. But since I'm not looking at any previous research unless they happen to be specifically in this field, it's not something they're going to know about. I don't think they have a role. It's possible they do and I don't know about it (Lecturer).

While acknowledging that keeping updated was their own responsibility, some participants nonetheless considered that the library also had a role to play, such as in making them aware of the different KUTD services provided.

P45: Simply raise awareness that the library has a keep-up-to-date service (Research Associate).

Specific means suggested for the library to make participants aware of their KUTD services were emails, lists of publications, open access to a wide range of information resources and journal subscriptions.

*P23: So I think the library, if they had something, they would need to sell it a bit. They would have to go “We’ve got this tool and you can download it and it will help you do this”. If it’s going to be, I need to go to the library and ask them to do something, I think that’s a barrier that I would never overcome. But if they had something on the library website saying “Here’s a link to all the alert tools, and these are ones that are used in this discipline,” you might do that. I think it would have to be something that’s online and something that is like “Here’s a tool that might help you (**Research Associate**).*

A further suggestion was that the library could provide training sessions on KUTD, such as via the Researcher Development Programme (RDP), which is a development body which focuses on creating a high-quality research environment by supporting collaborative working and development skills.

*P17: The library offers courses that are on RDP, but there isn’t from what I see a course on how to keep up to date, how to set up journal alerts and citations services, all these kinds of things. So I think the library could take the lead on it from that point of view, add it to the offering that they have for the RDP programme (**PhD Student**).*

Another participant proposed a monthly KUTD event.

*P8: Maybe what they can bear in mind is they could organise regular events, like once a month there is a ‘meet an expert’ session, because a lot of people are unaware that there are experts there at their disposal that they can go and see. So maybe if they started those events, and you get a notification once a month saying “Hey, we are hosting these events. There is a chance for you to meet your librarian”. Or get to know experts in your field who deal with information storage. I think I would be interested in going to one of those. I don’t know, grab a coffee and discuss what kind of services they offer I guess. That could work, potentially (**PhD Student**).*

Participants also suggested some practical ways for the library to improve KUTD among staff and PhD students, such as by offering them support on how to conduct searches, to be able to create more accurate keywords and concepts, to use their time most effectively, to search for relevant papers, to read more productively, to identify the most important ideas and to find the most important papers.

*P25: We have a huge amount of papers that are published, all of which could be relevant to my research. And the difficult thing isn’t finding those papers and those journals, it’s working out which ones of them are actually worth me investing my time in. And so the role that the library can play I suppose is in helping to train you in using the tools that are available, ways of refining searches, ways of narrowing down through looking at, I don’t know, general impact factors and metrics like that. Working out where they can’t say for certain that a given paper is most important, but they can give you tools and techniques to narrow down their enormous pile into a smaller amount of work. So yeah, I think that the number one thing that I would see would be support on using available search tools, digital tools, and training in using those. Yeah, that would be the most valuable role that the library research services could offer (**PhD Student**).*

Finally, a number of participants emphasised the need for a strong connection between the library’s KUTD services and potential users, via their library accounts to make them aware of different services.

*P24: If it advertised more...because everyone has got a library account, but it seems all the library seems to have is your loans and your requests. It would be good if you had an account and there was more in it. There was more sections, what areas you are interested in, and that way the library could give you a feed of things that are coming in. Like when you go onto your Pegasus, there’s different areas, your curriculum, a little map, email. That would be good if the library account had more things in it. Yes (**PhD Student**).*

7.7.5 Role of the University

The results show that while the university did provide a number of ways to keep staff and PhD students updated, these efforts seem to have been mainly individual or departmental. It also appears that these were not necessarily the best ways or most effective ways to KUTD and that not everyone was aware of them. Therefore, participants made some suggestions to strengthen the university's contribution to KUTD services.

A number of participants began by emphasizing that KUTD was their own responsibility, not that of the university.

*P1: Once again, as an academic, you work in a field, in a discipline or at a university. So probably the university relies on you to identify the latest developments in the field (**Research Associate**).*

Other participants mentioned a number of steps that the university could take to ensure updated information for all staff and PhD students; for example, it should continue providing open access to information resources.

*P19: Carry on paying subscriptions for IEEE. I think that's the main thing. You just need that access to literature. Yes. Not inhibited access. Because when say, if I wasn't at university, I would have to pay to read all these papers. That's the main thing (**PhD Student**).*

It should also facilitate and offer more funding for attendance at conferences and different events, while bearing in mind the need to spend wisely.

*P2: Give me money to go to conferences. No, they can't. Basically the university could just enable me to do my job, but it's my job to keep up to date on my specific area. And so we need access to the journals and those require paid access a lot of the time. On the flipside, if we want everything to be open access we need to pay journal fees. If you want to attend conferences, seminars, outreach talks, public stand lectures, I do get some stuff from that, but not much. I'll go to the general talks. They all cost money basically to do, and so we have to bring our own money to afford it. So other than more travel, funding the costs, they can only really offer services that pay, that cost money (**Lecturer**).*

Alternative suggestions involved alert services and newsletters providing information about events and conferences and news about the staff and their work or achievements across the university.

*P4: We have a newsletter from the engineering department. That's quite nice, just to read some of the highlights from the last month. If there any people who won for example a prize in some sort of conference, or a new professor starting. This can also point you at which tendencies the department feel that research is going towards, or which direction. There's suddenly a lot of professors who are employed with a certain focus, then that's probably because the university feels that research should be moving in this way (**PhD Student**).*

Meanwhile, the university already sends regular emails with news of events and conferences, but some individuals felt that they received too many emails about different things every day,

making it difficult to focus on these alerts. Therefore, it would be more efficient to have a single place or page on the university website dealing with all such matters.

P6: They do have, what is it, not the Gazette, every Friday or whatever we get an e-mail about events. And yeah, on the right-hand side, that's where all the events are listed. I suppose it's up to the individual departments or research groups to put their information up there, but if they do that then at least you have access to it. I think the problem is that we get so many e-mails that sometimes we ignore things. And again, what I would like to see is if there was a place on the website, and there used to be I think, but on the new website I don't think there is, where you just go for university events, and everything is there (Professor).

In addition, the university could use this website to promote information about profiles and research of academic staff which would help to keep staff and students informed about what research projects were underway and who is doing what inside and outside the university.

P2: The university website is under re-hashment and that could be better but that's again maybe not getting information for me but on the flipside it gets my research to others. But the idea is that if I can promote my research then people can contact me, and then we can set up collaborations that way. Which is a roundabout way of getting, so to have website be current and up to date, our profiles be up to date, if I'm looking at somebody they have to be able to look at me (Lecturer).

Moreover, participants reported that they wanted to know more about the projects or activities of colleagues or other staff members via services or social events across the university and at a departmental level, as well to enhance knowledge and information sharing.

P8: I think what can be done potentially, will be to have maybe newsletters, but that are targeted to particular departments. I wouldn't necessarily be interesting in what happens in the field of chemistry or biology. But if we have maybe a service within our computer science department, that says "okay, your colleague published such and such a thing", maybe that would be of interest. I think this is lacking at the moment. We've got seminars, we've got some events but we don't have a service that will provide you with information on what other people are actually working on. Unless you go up and talk to them, it is impossible to know that (PhD Student).

Information and knowledge sharing can be conducted through research groups and seminars which the university already provides, but participants suggested new functions for events, such as sharing pieces of information and justifying why they are of interest, or discussing things that need to be learned.

P11: Yeah. I think, I guess this is department level, I think hosting the seminars that they do, I think that is a useful thing. When you see the research that other people are doing, it can trigger things that you want to learn more about and clue you into what other people are doing and trends in the area. Buying the systems and the tools, and the databases, all those kinds of things, that's a really useful thing. I guess there potentially is, there might be workshops that they might put on (Lecturer).

Some participants recognized that the university had clear goals to achieve and that in general, it provided the means to meet these aims. For example, most of the services that participants suggested that the university should offer already exist.

P21: So in terms of the research assessment frameworks. The university I think does its best to keep you updated in terms of Horizon 2020 calls for funding, perhaps less in terms of the ESRC. But I think the

university, the information that they give you is targeted towards the things they want you to do. And for that it's kind of helpful. So at least you know what the university wants and where their strategic direction is (Professor).

However, others expressed dissatisfaction with the ways that these KUTD services were delivered, such as having only one annual researchers' presentation day and failing to ensure that seminars were well directed or related to participants' needs. There was therefore a need for more systematic ways to provide these services and to make staff and students aware of them.

P23: They do a weekly digest, which is useful in telling you what seminars are going on in Strathclyde. I think things that get sent round, in terms of what's going on in your field is very much who you know. People might send something because they've got it and they think that you might want it, but it's not sort of systematic from an institutional level, it's just someone who's got it and they thought that you might want it. And that it's helpful, but it's not systematic from an institutional level, it's just someone thinking you might be interested in that (Research Associate).

Further suggestions concerned ways to maximise the benefit to staff and students of all of the KUTD methods and services that the university might provide. Firstly, consideration should be given to the department level in terms of speed of change and of the tools and methods that would be most effective for a particular department or field.

P3: I think part of it's understanding what do people do in a discipline, and then figuring out a way to make that work. Because trying to get people to use a tool can be a very challenging thing. People often want the technology to fit in with what they normally do rather than having to download something new or those kinds of things. So I think part of it would be understanding what people are looking for, and what works for people. And if your discipline is on Twitter, that would be a good place to be. But if your discipline is on academia.edu or whatever it is...so I think there are aspects of that. I also think there are aspects of personal, what people want. I think it's a bit complicated because I think a lot of it has to do with how people work, which there's a lot going on in a lot of different areas (PhD Student).

A few participants said that having a mailing listing and allowing staff and PhD students to interact with it would be one of the best ways for the university to keep people up to date. In addition, the university could dedicate a mailing listing for professionals, to facilitate conversations among the staff and to facilitate more private focused conversations about particular topics or fields.

P10: I think it would be nice to have some kind of robust professional network, or peer group, or mailing list within my specialisation of education, within my specialisation of science. Because we're chunked by department or faculties, you kind of say "okay, within chemistry there's a professional network of organic chemists (Lecturer).

Another suggestion was that the university could appoint dedicated subject librarians who are aware of what staff are interested in and what they are working on.

P28: Is dedicated subject librarians, so librarians who know the academics in their area, who know what they're working on and what they're interested in, and feed them stuff (Professor).

A final suggestion was that the university should provide training courses to cater for the specific needs of staff and PhD students.

P26: so I don't think I've had any formal training in literature reviewing and I don't think there's anything offered. I might be wrong. There is when you do your PhD, welcome thing like induction week, I think for a couple of weeks. There is a module on literature but it's very it's basically for everyone in the university so it's very vague because everyone does the literature review differently. I think possibly some sort of research methods would be useful for that or even I don't know if there'd be a way to get a sort of people who are working in roughly the same area to get a sort of shared body of literature (PhD Student).

In conclusion, participant reported that belief that KUTD was their own responsibility and that while the library might share this with them, it was certainly not the sole responsibility of library or the university. However, both the library and university were seen to have roles to play in helping staff and PhD students to KUTD. For example, the library should improve awareness of KUTD services and provide training sessions to raise the quality of information searching and retrieving of users. For its part, the university should be more systematic in facilitating KUTD and to consider the department needs, speed of changes and types of methods or tools to be used. In addition, participants would like to have a system to help them to fit KUTD in their daily routine such as a single page on the university websites collating all relevant information on sources and KUTD services.

7.7.6 Participant's Comments

This section offers an analysis of responses to various open-ended questions, namely the general interview question inviting further comments and four questionnaire items: Q24, which also invited general comments on KUTD services, Q8 on crucial KUTD tasks, Q14 on other ways of keeping updated, and Q15 on obstacles.

Responses to Q8 using the five options listed in the questionnaire are analysed statistically in Chapter 6. In addition, seven respondents specified tasks not listed with which they felt it important to keep updated, namely external citizenship (e.g., decision-making committees, public policy decisions regarding disciplinary matters, funding, etc.), intervention design and evaluation, and policy implications.

Q14 asked about other KUTD tools or methods not specified in Q13 (Section 6.3 General Information on KUTD). There was general agreement that the list in Q13 was comprehensive. However, a few engineering and sciences participants suggested mailing lists as a valuable method, while other participants added discussion groups and communicating with supervisors.

*P20: Sometimes being included in mailing lists in which people share tidings about my job and field can help me, because it is a good place to share interesting upcoming articles (**Research Association**).*

*P2: Research group colloquia, department seminar series, journal clubs, sharing between group members (staff, fellows, PhD students, etc.) can be ways of KUTD (**Lecturer**).*

It was the general open question at the end of each interview and questionnaire inviting any further comments which drew the largest number of responses, on many different topics. For example, some participants shared what they had learned from experience as to which KUTD strategies were particularly useful, identified various KUTD obstacles or suggested other good ways to KUTD. However, not all participants added comments or answered this question.

In terms of KUTD strategies, some participants emphasised the need to prepare by building a foundation of previous knowledge in the field, to identify a specific focus and to decide on a direction.

In order to build one's knowledge, it is essential to have a basis of facts about the field, as both students and staff made explicit.

*P21: If you're not really up to date and on top of things, then you wouldn't even be able to read our research. So it makes it really difficult for new people entering the field. They have to learn a whole new vocabulary and all the history, where all the thoughts come from and how it's developed and what's in vogue and what's not in vogue and so on and so forth (**Professor**).*

Seven participants mentioned the need to make KUTD part of their routine by dedicating some time to it every week, adopting the habit of searching for the latest developments.

*P14: I think you just need to give yourself time each week, maybe three hours or a day, to just see what's going on. Not working every day in the lab and then leaving it to the end, because you might miss so much stuff that you could have done in your research. I'm trying to use three hours each week, just to keep up to date. Just to search about things that are related to my topic (**PhD Student**).*

Treating KUTD as a routine activity was said to have many advantages, such as discovering the most effective tools to be used.

*P2: There's just a wide range of tools. But no, other than you just have to keep doing it and try and find tools that are efficient and minimise the amount of tools I have to use (**Lecturer**).*

Making it an everyday practice would also result in improved KUTD skills and processes.

*P26: So I think it's probably the most important thing is to make it a habit, so I don't think anyone's keeping-up-to-date strategy is going to be perfect, but if they keep trying to keep up to date. It's basically about setting aside some time and by practising we could have another way to control or to filter much better than, you know, so I think it's important to make it a habit (**PhD Student**).*

Many participants felt that the information explosion, the proliferation of information resources, the number of different tools to be used to search for information and new publications every day made it very difficult for individuals to be sure of keeping abreast of

developments at all times. In response to this difficulty, seven participants made suggestions including keeping up only with the general trends in the field, adopting selectively only those tools or methods which proved to be the most effective for a particular user, and asking the advice of others with previous experience in order to identify the best methods.

P4: You don't need to know everything all the time, constantly. It's a lot more rewarding to have a general idea and then to focus in depth on a few things. And I think that maybe needs to be highlighted more (PhD Student).

Another participant said that the key factor in KUTD was focusing on the content and methods to suit individual needs.

In line with the suggestion that PE is the best way to KUTD, participants also stressed that interacting with experienced colleagues allows their existing knowledge to guide one's choice of the most effective methods.

P2: There's so many tools, so if I can reduce the amount of tools I use or if I can discover ones that are more effective, and the easiest way is if someone else has already tried it out, vetted it, and tells me then without me having to go through it and do this. So, I generally just ask around, or if it comes up every now and then, pull to see if someone's found something better or if I can eliminate the amount of duplication (Lecturer).

Some members of staff made a distinction between active and passive approaches to KUTD, depending on their needs at any given time, noting that their peak of KUTD activity was when they were in the process of submitting a paper, giving a talk or making a presentation.

P11: Yes. It's like the intensity when I have something that I've got to do, the intensity increases and all of a sudden I'm actively doing things. Whereas I think generally, on a regular basis, I'm much more passive. So I put myself in situations in which I would get information, I've signed up for those e-mails from journals. I keep up to date on social media, I make friends. And so things will come to me in a much more passive way. But then when I've got a specific task, then things really ramp up and then I'm actively doing all kinds of searching and finding and those kinds of things (Lecturer).

So far, the findings indicate that staff tended to be passive seekers whenever possible, whereas students would search and seek continually in order to build their knowledge base. In other words, individuals with a higher level of knowledge about the field would tend to be passive seekers, depending on information encounter rather than searching actively for information.

There were some indications that participants were generally satisfied that when publishing a paper or contributing to a conference, for example, they would manage to find relevant information and know how to KUTD and which direction to choose.

P2: I'm confident that it's average. I think I'm covering most of the centralised papers, publications of what's going on. I understand that I'm missing fringes of it, but it's a conscious decision. So maybe I'm confident in the fact that I'm getting enough of the majority of it (Lecturer).

The general sense that participants could find the information they needed to KUTD is consistent with the analysis in Chapter 6 showing that the majority rated themselves as competent.

On the other hand, participants identified several factors limiting their ability to KUTD, such as the absence of relevant training, poor understanding of the research landscape and an inability to distinguish between relevant and irrelevant information. Overcoming these obstacles would make them good at KUTD, as mentioned previously.

A number of participants reported that because they had not received adequate training on how to KUTD, they had to do their best to discover their own ways of doing so without explicit instruction. They felt that KUTD involved so many complex processes that time and experience were essential, along with advanced training.

P25: I think it's just the volume of information that's available. And I think it takes experience and time to be able to work out which information is worth spending time on and what isn't, so I think part of it is just sort of a learnt instinct and an understanding of being able to judge quickly when to read a whole paper to read the abstract, when to ignore something. Understanding which journals tend to have high quality papers, which tend to have less high quality papers, which are most relevant. So there's quite a steep learning curve in all of those (PhD Student).

These responses also confirm the finding from the questionnaire analysis, that the majority had received no KUTD training courses organized by the library, nor even online sessions. On the other hand, some participants mentioned that their ability to KUTD was dependent to some extent on whatever training they had received.

P1: So if you accept the fact that you don't know everything and that you will need to ask other people and get trained, etc. I think that's what makes you an expert rather than saying "Oh, I know fantastically how to use all of these tools, and I'm a super expert". I mean, saying "I'm an expert" is realising that I have, I think like everyone, I have my limitations and I need help. So it's just knowing or realising that you cannot know everything (Research Associate).

With regard to obstacles and difficulties, the majority of interviewees and respondents to open-ended questionnaire items identified lack of time, including the time needed to set up tools and to KUTD, as a potential constraint to keeping updated.

P3: I think obviously the speed is always a consideration to be honest, because you need time to absorb whatever you need to learn, basically. And if you're trying to keep up to date at the same time, it's extremely difficult. So for example I expect to go into an application or a tool or whatever, and it should be minutes to set up. And it's not because I feel like we design these tools for people to use with a specific purpose. If you have to spend hours or days doing that, then the tool to me hasn't been designed well in the first place (PhD Student).

Another obstacle that a number of participants identified was the information overload, whereby the sheer volume of information resources which needed filtering would present major problems for anyone working in inter-disciplinary or multidisciplinary areas.

P4: I think it's the amount of information that exists. I have a feeling that when you didn't have access to the internet and everything was electronic and there were a few number of books that you would definitely read, and then some conference proceedings that you would probably read once a year. But now, it's like there's no way a person can stay up to date and also have time to do their own research. There's just too much information (PhD Student).

Terminology represented an obstacle for a number of participants. Some mentioned the inconsistent use of keywords within or across fields, the need to modify them during the setting-up process and the unhelpful nature of some article titles. In addition, participants raised these issues when discussing the use of AS and CS methods.

P2: Too many different platforms, volume of papers generated is enormous, inconsistent keywords/technical terms in fields, cross-field differences, etc. which affect search results (Lecturer).

A few participants, by contrast, referred to factors making it relatively easy to KUTD, namely the accessibility of information, the ability to find the information they needed and identifying key authors in the field.

P20: I think it is because you can access the information that is published in real time, with the alerts, etc. So in that point I think it is easy to know what is happening, what is being published. So in that way I think it's easy to keep up to date. But it's true that sometimes there are things that are not being published and are happening. You can only know about them by talking with people (Research Association).

Finally, a lecturer identified some additional ways of enhancing the practical side of KUTD.

P2: An up-to-date website reference that links different (currently popular) options for keeping up to date, with comments on the applicability, pros/cons to each, etc. I do not need an entire training course for these (Lecturer).

He added that such a website should include the following:

- 1- *Some services come and go, I want to check if the ones I am using are still useful, if there are others that are better/more applicable to me.*
- 2- *Any tips and tricks that I could be doing to make it more efficient. e.g., having Academia.edu, ResearchGate, Mendeley pull from each other and Google Scholar so it is less work to have to keep my publication record up to date.*
- 3- *Any other ideas that people have tried to increase their citation rate, and more efficiently scan for recent & relevant research in one particular field/application (Lecturer).*

This analysis of written and oral responses to open-ended questions has considered a range of general comments on alternative KUTD strategies, difficulties faced and suggestions to improve KUTD practice.

7.8 Summary

This chapter has analysed answers to 'why' and 'how' questions to add depth to the analysis of questionnaire questions. In addition, the interview analysis has raised some important issues that can be considered from university, library and individuals.

Demographic factors were first investigated to determine whether they affected the usage of the different methods. Age appears to have some effect on methods such as the PE and SM groups. However, it seems that there is no clear picture about which of the KUTD methods were most used or by whom: instead, each of method or tool has its particular advantages, drawbacks and related skills.

Notably, a new and previously unidentified behaviour is mail listing, which a number of participants referred to as a way to ask colleagues for up-to-date information.

Certain themes appeared on many occasions. One was time, as participants stated that an obstacle to KUTD was the time needed to read new material, to explain their needs to library staff and to set up some tools. Another was information overload as a result of using particular methods or because of the high speed of change in some fields. A third major constraint to KUTD for PhD students was the inability to distinguish between relevant and irrelevant information.

With regards to the university and its library, participants acknowledge the existence of some KUTD initiatives across the university, but complained that they were neither systematically organized nor continues, that they were not implemented in the most ways and that they often failed to consider individual users' needs, which reflected the limited support for KUTD services. Participants also asserted that was inadequate delivery of KUTD services, no description of the different possible KUTD strategies and inadequate guidance and support to facilitate or explain the use of KUTD services. Furthermore, there is no evidence of the university providing basic support, such as reminding users that the service exists.

For all of the above reasons, participants correctly identified the need to dedicate a single webpage or link to collating all available and necessary information, such as on how to access and use KUTD tools, with details of related courses, events, seminars and workshops, all of which should be added to the university calendar. Moreover, the library needs to provide training sessions on using the various tools, setting up alert services, searching for particular terms, dealing with terminology problems and distinguishing between relevant and irrelevant materials.

Chapter 8: Discussion

8.1 Introduction

The present research has examined how staff and PhD students keep up to date with developments in their field. It marks an attempt to bridge gaps in the literature by investigating the phenomenon of KUTD among staff and PhD students from two perspectives, namely those of the library as service provider and of its users as service owners, in order to determine what the ideal situation is in keeping updated. The research has been guided by seeking answers to the following questions:

- What methods of KUTD are most frequently used?
- Is there any association between age, gender, experience, faculty or position and differences in using KUTD methods?
- Do participants face any obstacles or difficulties in KUTD?
- What are the factors motivating the usage of the various methods?
- What is the role of the library in providing KUTD services?

This chapter reviews the main findings and draws conclusions as to whether the study has adequately met its objectives and answered the research questions. The discussion of responses to these questions considers all appropriate interpretations and explanations, and integrates the results from both the quantitative and qualitative arms of the study. The chapter also makes recommendations and suggestions for further work in related areas and the limitations of the current research.

The discussion refers from time to time to relevant contributions to the literature. However, there is, to our knowledge, no directly comparable research on how staff and PhD students KUTD; therefore, such comparisons have had to be made to literature whose focus and direction differs somewhat from those of the present work.

There are several reasons for the current findings to differ from those of previous studies. Firstly, the purpose of the present research is to investigate how staff and PhD students KUTD, whereas most of the studies reported in the literature focus on ISB and online searching for information, with very little interest in KUTD. Secondly, academic fields or

disciplines can differ in culture or academic environment, in the nature or degree of scattering and in type of information or search techniques, and all of these factors can influence individuals' choice of information searching methods. Finally, academic position, roles, habits and practices of staff and students can also affect the search methods or tools used.

The following section addresses the first questions, as to which methods of KUTD are most frequently used, by discussing the methods which were found to have been used and their relative frequency. It also partially answers the second question by considering the extent to which they were affected by different demographic factors, as revealed in the results presented in chapters eight and nine. To focus the discussion, it considers each group of KUTD methods in turn and considers individual methods only where these have been found to be affected by one or more demographic factors, as set out in Table 27.

8.2 Methods

8.2.1 Academic Tools

The results show that among AT methods, the use of 'professional association websites' was affected by demographic factors, namely gender and faculty. In addition, the results show that senior participants evaluated this method of KUTD highly. The reason for this is that it provides a means of following government policies and regulations while keeping in touch with the professional community. It can be seen as a way of measuring the active pulse of the community of professional practice in a given academic field.

There appears to be no comparable discussion in the literature of professional associations and academic usage, the reason being a difference in research purposes, in that the present research has been concerned with the process of searching for information in order to KUTD, whereas the literature indicates the possibility of obtaining different results from the use of different methods if the purpose of the search for information differs.

With regard to the CCA results, these confirm that participants who thought it important to KUTD and were experts in their field tended to use AT as a way to KUTD. Most of the methods in the AT group represent a high level of knowledge and advanced types of information. This association may be related to the fact that participants with a high level of knowledge were likely to depend on high quality and up-to-date information; therefore, they tended to favour the use of AT tools, because they have a strong background and advanced

knowledge in their topic. In contrast, PhD students reported some difficulties, such as being unable to distinguish between relevant and irrelevant information and finding it difficult to search and navigate on some AT websites. Many contributors to the literature also indicate that staff tend to use academic tools such as databases (Sahu and Nath Singh, 2013; Chaudhry and Al-Mahmud, 2015; Borrego and Anglada, 2016). A further finding of the present study is that that males with more experience tended to use academic tools more often, which is consistent with reports in the literature that males are better at searching online for information (Jackson et al., 2001; Schumacher and Morahan-Martin, 2001; Liaw, 2002; Koohang, 2004; Karavidas et al., 2005; Large et al., 2002; Peng et al., 2006; Li and Kirkup, 2007; Hu et al., 2012). This does not mean that females are not good online searchers, but merely that the two genders differ in how they use online information, with females tending to do so more for communication purposes, whereas males tend to have educational objectives (Hupfer and Detlor, 2006; Tsai and Tsai, 2010; Drabowicz, 2014). As academic tools represent a very sharp focus on academic types of information and males focus on educational purposes, this may explain why males tend to use AT as a way to KUTD.

8.2.2 Alert Services

The CCA results, reveal that no important findings that should be considered in respect of alert services. The interview data illustrate a tendency among both staff and PhD students not to use AS very much to KUTD. Interviewees mentioned several factors which may explain this low usage, such as information overload and misalignment of terminology.

Surprisingly, the literature review found evidence of alert services being considered the best way to KUTD, along with online tables of contents, for three reasons: because they provide an easy and quick way to stay updated with relevant information and general trends without involving intense computer use (Zandian et al., 2010), because they can save time and effort (Attfield and Blandford, 2011) and because the library can use alert services to deliver important and time-sensitive content monitoring and references by email (Jetty and Anbu, 2013).

Furthermore, previous studies have highlighted the use of alerts by users in various disciplines including engineering, astronomy and physics, as well as inter-disciplinary scholars, to KUTD and find recent articles (Jamali and Nicholas, 2010; Sahu and Nath Singh, 2013; Arshad and Ameen, 2018). Finally, younger academics and PhD students aged between

35 and 39 years were found to rely on alert services to KUTD (Jamali and Nicholas 2006; Robson and Robinson, 2013).

Jiang (2013) states that the use of alert services is a passive monitoring behaviour that individuals may be unfamiliar with, while Jetty and Anbu (2013) assert the need for further research, due to the paucity of studies of the use of alert services by academics.

There may be many reasons for the differences between the results of the current research and those reported in the literature. Firstly, previous studies have tended to focus on ISB and to include KUTD as just one such behaviour, so that differences in the purpose of the search are likely to lead to the use of different methods or tools and subsequently to different results. Secondly, the literature, as mentioned above, stresses the need for more comprehensive studies on the usage of alert services, while the literature on KUTD and AS is in general is very limited and not quite up to date itself. Thirdly, the current research coincides with a rapid increase in information flow (indeed, an information explosion) and a growing tendency in the 21st century to adopt an inter-disciplinary approach (Trowler, 2001; Trowler et al., 2012). Dealing with massive amounts of information can lead academics to feel that they are overwhelmed and suffering information overload (Wu and Chen 2012; Attfield and Blandford, 2011). In addition to terminological barriers, which include keywords and too many synonyms, the current research has shown that the library was not active in providing KUTD services in general but merely provided access to information which most participants relied on, perhaps as a result of the changing roles of libraries and end users in the current electronic environment. For all of these reasons, the current research has shown that there was low usage of AS to KUTD, in contrast to the findings reported in the literature.

8.2.3 People and Events

The CCA results show, that PE as a group tended to be used by older people with long experience in senior positions. This finding is consistent with the interview findings, but it also reveals that most participants evaluated PE as one of the best ways to KUTD. A difference of perspective was evident between senior and junior academics, as long experience and a high level of knowledge allowed the former to derive the maximum benefit from these KUTD methods. Another advantage enjoyed by senior academics is their ability to use communication technology to maintain contact with a network of peers, thereby accessing a very substantial body of current specialist knowledge. In addition, having a

limited budget to attend conferences makes it difficult for students, for example, to attend without contributing to knowledge of the field. Lack of knowledge of the field and difficulty in distinguishing relevant from irrelevant information can also be barriers to students' getting the most from attending conferences. A clear contrast between staff and students is that the latter reported usually asking their colleagues or students in the same office or department for information, which means that they depended more on the internal community, while staff communicated with their peers across the whole academic community, both inside and outside their own department or university. Moreover, senior academics had longer to develop wider and more sophisticated personal communication networks during their longer careers and their peers could play an important role in filtering out irrelevant information while facilitating useful information. Therefore, communication with their peers created a good opportunity to identify rich, in-depth information and knowledge, which is why this group of users gained the greatest advantage from this type of communication. For all of these reasons, senior academics were found to benefit more from PE as a way to KUTD.

The findings of the current research with regard to PE are consistent with those of previous studies, which have shown that older academics rely on interpersonal communication and conferences to KUTD (Sahu and Nath Singh 2013). In addition, they depend on formal and informal (face-to-face) communication and both internal and external communications (Arshad and Ameen, 2018; Ashokbhai Bhatt, 2014; Connaway and Dickey, 2010; Haines et al., 2010). The literature also offers similar explanations to those given above as to why senior academics tend to use peer-to-peer communication more than their junior counterparts (Pontis et al., 2015).

The finding that academics in both the Sciences and Engineering and Humanities faculties and some senior inter-disciplinary staff relied on personal communications with their peers to KUTD is consistent with a number of earlier studies (Chaudhry and Al-Mahmud, 2015; Arshad and Ameen, 2018; Jamali and Nicholas, 2010; Given and Willson, 2017; Ashokbhai Bhatt, 2014).

The literature also goes into more detail of how the level of seniority determines the different methods used to search for information, asserting that a higher level of subject knowledge can reduce the desire of senior staff to KUTD (Pontis et al., 2015). This is beyond the scope of the current research, which is more concerned with methods used to KUTD, but further investigations are needed in order to test this hypothesis.

On the other hand, junior academics depended on electronic sources and suggestions by senior staff (Robson and Robinson, 2013; Drachen et al., 2011). In the current research, junior participants reported a perceived need to build their knowledge in order to catch up with what was already known about their field and to strengthen their background knowledge of particular topics, meaning that they had to identify their research boundaries before they could begin to KUTD with recent developments. Therefore, they relied more on other methods such as SM and LS. This may explain the differences between the current research's findings and those of earlier ones, and how the purpose of searching can lead to the use of different tools or methods.

This finding emphasizes the importance of departmental or university-level research communication or group meetings, which our department does already. Such practices can help students in multiple ways: to better understand the landscape of their field and be aware of different streams within the discipline; to integrate with their academic community, so increasing the effectiveness of their research; and to strengthen their awareness of terminology and concepts used in their field, thus enabling them to find information and judge its relevance.

8.2.4 Social Media

In terms of CCA findings, females with less experience tended to use SM tools more than males. This result reflects evidence regarding the online behaviour of females, who tended to have more positive attitudes than males towards the social aspects of using these tools to support their communication habits. This finding is consistent with previous studies reporting that females use social media more than males (Thelwall et al., 2010; Brenner, 2013) and with those which have found SM use to be an important tool for scholarly communication and information sharing (Schonfeld and Housewright, 2010; Osatuyi, 2013; Sobaih and Moustafa, 2016).

Analysis of the interview responses reveals that younger participants tended to use SM more than those aged 40 and above and that the usage of SM was generally low among staff and PhD students.

Previous studies have found that PhD students used social networks to KUTD (Bolton et al., 2013) and that junior academics were more active on SM (Procter et al., 2010; Dutton and Blank, 2011). On the other hand, older and more senior academics tend to use general SM

tools such as Twitter to communicate with peers and promote academic works (Letierce et al., 2010; Weng et al., 2010; Cruz and Jamias, 2013; Gruzd and Staves, 2011) and RG to encourage collaboration (Shrivastava and Mahajan, 2015; Manca, 2018). In line with these studies, the current research has found that senior academic tended to use Research Gate to promote their academic work. The finding that younger and more junior academics used SM more than their older and more senior counterparts can be explained by how older people depend on their personal contacts, whereas junior academics tend to rely on less traditional channels of communication (Gruzd and Staves, 2011).

The findings of the current research are also consistent with reports in the literature of empirical evidence that the usage of SM is low among academics (Weller, 2011; Bik and Goldstein, 2013; Mas-Bleda et al., 2014; Shehata et al., 2015b). Many factors can be adduced to explain this. For example, most of the studies reported in the literature are limited and tend to focus on metrics such as number of views, downloads and followers to evaluate academic impact (Ortega, 2015b, Kousha et al., 2010; Eysenbach, 2011; Priem et al., 2012). In addition, many academics have been found to believe that SM is for entertainment purposes and can cause distraction and information overload (Phillips, 2011). Similarly, the current research found that irrelevant information, information overload and time wasting were factors underlying the low usage of SM to KUTD.

The literature shows that academics do embrace some SM tools that can support research activities, such as RG and Academia (Oh and Jeng, 2011; Nicholas et al., 2015), that some disciplines use particular SM tools more than others, as mentioned in (Section 3.1 Social Media), but that SM use is limited in the academic environment (Weller, 2011), for various reasons mentioned in the SM section (Debatin et al., 2009; Phillips, 2011; Au and Lam, 2015).

On the other hand, some disciplines are characterized by high usage of certain indicators; for example, natural scientists use social contacts and browse papers (Rowlands et al., 2011), while the high usage of social media in HASS is a result of generally being active on these platforms.

Notwithstanding the reported heavy use of particular SM methods within certain disciplines, the literature acknowledges the limitations of the sample sizes of the studies concerned and calls for further investigation of cross-disciplinary differences in using Twitter, for example (Holmberg and Thelwall, 2014). This is consistent with the earlier recognition of the need for

qualitative research to determine in greater depth why academics in particular disciplines use SM and what benefits they gain (Priem and Costello, 2010). The literature also reports that cross-discipline differences in SM platform usage may depend on the characteristics of the fields and their nature in general (Jordan, 2014). Importantly, SM is reported to be used to search for information, to communicate or for various other purposes in the case of particular tools, but not to KUTD. Furthermore, the current research is concerned with the different behaviours, including SM use, that are adopted to KUTD, whereas the literature focuses on the different tools, such as Twitter, Facebook and Academia. Finally, while there have been some attempts to understand SM use in an academic context, identifying age and experience as the factors apparently affecting it most strongly, this area of interest lacks a comprehensive examination.

8.2.5 Citation Services

The interviews findings show that CS can be a good indicator of general trends in a field and that participants considered them as a way to KUTD. However, information overload cannot be ignored, nor can the inaccuracy of the listed number of citations, which is anyway not a true measure of a paper's quality. Many studies in the literature discuss citation and referencing behaviour, but from the perspective of ISB (Frandsen and Nicolaisen, 2012; Athukorala et al., 2013). Also discussed in the literature are certain factors that can affect citation behaviour, such as age (Milojević et al., 2011; Larivière et al., 2013; Sugimoto, 2012), while fewer studies address differences in citation behaviour between staff and students (Sugimoto et al., 2011; Larivière et al., 2013) or how citation differs among disciplines (Jamali and Nicholas, 2010; Athukorala et al., 2013). Finally, some authors have examined the discrepancy between quality of work and number of citations, in addition to issues such as GS citations (Bosquet and Combes, 2013; De Winter et al., 2014) and Twitter and Mendeley reports (Zahedi, Costas, and Wouters, 2014; Holmberg and Thelwall, 2014; Oh and Jeng, 2011; Jiang et al., 2013). There is generally little consideration in the literature of citation and KUTD, but the current research uses these studies to identify aspects of citation behaviour that can be used to KUTD.

8.2.6 Multimedia

The majority of participants tended not to use multimedia often, while appreciating that it could be used to obtain general information about a particular topic. They reported obtaining basic information or knowledge by watching video clips or listening to audio clips. The CCA findings reveal that younger participants, with less experience and in junior positions had a greater tendency to use MM to KUTD. This is consistent with the literature, as it shows that PhD students' lack of knowledge and experience led them to search for graphics, audio and videos clips (Sapa et al., 2014).

In line with the earlier discussion of KUTD methods, the model in Figure 3 provides strong guidance on selecting the types of methods that staff and PhD students can use in order to KUTD. In this model, the current research is the first to identify different behaviours, approaches and modes of KUTD. The model reflects the reality of using different methods and shows how the literature depends on particular method only. Previous studies have mentioned some methods that may be similar to what the current model identifies; however, the literature recommends alert services as the best way to KUTD, which the current study disproves. The KUTD model helps to identify all of the potential methods and behaviours that the extant literature does not cover or mention.

The model proves that active online searching and browsing are the main behaviours that staff and PhD students depend on to KUTD. It also shows that passive monitoring was rarely used to KUTD, a finding that contradicts those previous studies which have reported that alert services are the main method used. In addition, the model shows that participants tended not to use active or passive chaining to KUTD.

Previous studies also fail to identify searching professional websites as a KUTD method, whereas the present model shows that senior staff depended on it. Moreover, the model identifies PE as the best way to KUTD, while the literature suggests that the best method is to use alert services. In addition, alert services represent passive monitoring, which most participants were not familiar with, and they associated this method with information overload and terminological difficulties in using keywords. The earlier discussion of KUTD methods reveals many reasons for how the current research has investigated different aspect of methods in general. In particular, the current research was the first to investigate KUTD and how the purposes behind KUTD or ISB can lead to different choices of methods and different usage. Therefore, the model identifies possible behaviours, modes and approaches

from the perspective of KUTD, not ISB. The importance of the KUTD model and the current research were confirmed by testing and validating the model and its methods using questionnaires, interviews and other methods, which reflects the importance of the model in identifying and illustrating the most effective ways to KUTD and in identifying the obstacles to the use of other methods. A strength of the model is that it both categorises KUTD tools and indicates ways of matching them to users' needs and of training academics in improving their use of the different methods by learning the skills they need to search for information, retrieve it and filter it appropriately. In this way, the present research in general and the model in particular will assist in improving the design of KUTD services.

8.3 Demographic Factors

This section specifically addresses the question of whether there is any association between age, gender, experience, faculty or position and differences in using KUTD methods. The findings reveal that age, experience, gender and position were the factors having the greatest influence and that the KUTD methods on which these factors had a clear effect were AT, PE, LS, SM and MM.

In terms of age, it was found that younger participants tended to use LS and SM more than older ones. This finding is in accordance with earlier studies (Procter et al., 2010; Gruzd and Staves, 2011; Robson and Robinson 2013), which found that younger academics were more active on social media. In addition, the literature reports that increasing age has been found to correlate with fewer visits to the library and that younger people spend more time accessing library webpages (Williams and Rowlands, 2010; Restoum, 2016).

The present findings show that individuals who were older, in higher positions and with longer experience tended to use PE and AT more, while younger ones with shorter experience tended to use LS, SM and MM. This finding is line with studies reported in the literature, concluding that position is an important factor that can affect ISB (Niu and Hemminger, 2012; Isah and Byström, 2016). In addition, senior academics have been found to interact with peers and to rely on interpersonal communication more than junior academics (Catalano, 2013; Kuffalikar and Mahakulkar, 2003; Pontis et al., 2015).

The finding that gender affected the usage of the LS and SM methods is consistent with the literature (Niu and Hemminger, 2012; Simmonds and Andaleeb, 2001; Shahriza Abdul Karim

and Hasan, 2007). More generally, females reportedly tend to use social media networks more than males (Thelwall, 2008; Thelwall et al., 2010; Brenner, 2013).

8.4 Obstacles

This section answered third research question, which considered the findings as to whether there are any obstacles or difficulties facing participants in KUTD, revealing that a number of factors were indeed identified as obstructing their KUTD efforts. These include information overload, lack of time and difficulty in distinguishing between relevant and irrelevant information.

8.4.1 Overload

A number of interviewees stated explicitly that information overload was an obstacle for the majority of PhD students and a minority of staff in higher positions. Participants associated information overload and receiving irrelevant information with the use of AT, AS, CS and SM. The findings also show that the volume of information resources needing to be filtered could be a major problem, especially for participants who worked in inter-disciplinary or multidisciplinary areas and those whose fields experienced rapid change. The literature discusses information overload in general as a result of the rapid increase in information resources and the use of advanced technology (Benselin and Ragsdell, 2016; Elwert, 2013). Some previous studies have found that using AS and SM can lead to information overload (Wu and Chen, 2012; Attfield and Blandford, 2011; Cann et al., 2011). Therefore, the literature suggests providing some filtering options to reduce the effects of information overload (Jetty and Anbu, 2013).

8.4.2 Lack of Time

The questionnaire findings show that over 66% of participants considered lack of time to be an obstacle to their KUTD activities. Further details emerged from the interviews, where participants specified that they sometimes lacked the time needed to set up tools or alert services, to search for and locate information sources, or simply to explain to the librarian what help they needed, all of which amounted to obstacles to KUTD. This finding is line with studies reported in the literature, concluding that job responsibilities and the growing number of information resources can affect the time needed to search for, locate and read known

items (Baro et al., 2011; Pontis et al., 2015; Khan and Shafique, 2011; Ge, 2010; Kress et al., 2011).

8.4.3 Keywords and Distinguishing between Relevant and Irrelevant Information

It was found that participants' KUTD activities could be affected by an inability to distinguish between relevant and irrelevant information, which could result from a poor understanding of the research landscape and unfamiliarity with the terminology and concepts in the field. These difficulties confronted PhD students especially, indicating a need to support students with advice on how to conduct information searches and to choose more accurate keywords and terms, in order to save time and effort while ensuring that they find the relevant information. This finding is in accordance with earlier studies which have reported that PhD students lacked advanced search skills such as Boolean logic or modified keyword strategies (Catalano, 2013; Sapa et al., 2014).

With regard to staff, the findings show that while they were better able to distinguish between relevant and irrelevant information, they still faced some obstacles in keeping up to date, especially inconsistencies in the use of keywords and terminology from one field to another, so that they would need to be modified during set-up, and the fact that the titles of some articles are unhelpfully worded, leading searchers to information of little relevance. The literature shows that staff tend to depend on interacting with their peers, which can play an important role in filtering information and identifying what is most relevant (Pontis et al., 2015; Pontis and Blandford, 2015; Adams and Blandford, 2005), whereas PhD students, lacking the networks for such interactions, often receive irrelevant information, which can lead to low usage of methods such as AS (Wu and Chen, 2012).

8.5 Motivations

This section answers the fourth question by identifying the factors motivating participants' use of different methods. The interview findings reveal that certain motivations could affect usage. Some of these motivations were related to the characteristics of the tools or methods themselves, such as their usability or ease of use, the time needed to set up a tool, full coverage of information sources or familiarity with a method or tool, while others were

related to individuals, such as their habits and personal preferences. Finally, environmental effects included the influence of peers.

Indeed, peer influence was found to be the main motivation for using or not using particular methods or tools. This is consistent with the observation in the literature that academics tend to depend on personal communications, to identify essential information resources, for example. They also discuss common areas of interest, allowing them to drill more deeply into a topic to find richer sources of knowledge (Niu et al., 2010; Pontis et al., 2015). This use of individual contacts can help them to seek new collaborations, share knowledge and disseminate information (Letierce et al., 2010 ;Weng et al., 2010; Cronin, 2003). The findings reported in the literature suggest that if academics depend on their peers to that extent, then their KUTD behaviour will be affected by their peers and they will use the same methods or tools to KUTD.

The second strongest motivation was found to be habit, meaning the use of a particular method every day until it becomes part of the user's practice or daily routine. The importance of habits in ISB in general is discussed in a number of studies reported in the literature (e.g. Brindesi et al., 2013; Engel et al., 2011; Rupp-Serrano and Robbins, 2013). These contributions are mainly rather general, however, not related to KUTD habits; they provide little detail about how to build habits or embed them in everyday routine, nor on how to develop or improve their effect on ISB or indeed on KUTD. Given the restricted time available, the current research could not address habits in detail; this topic merits further investigation to identify the factors that can affect the creation and operation of KUTD habits.

Finally, the results show that usability or ease of use, the time needed to set up a tool, full coverage and familiarity can all influence the use or not of particular methods or tools. This finding is in line with reports in the literature such as those showing search engines to be popular because of their usability, friendly interface and full coverage (Haglund and Olsson, 2008; Jamali and Asadi, 2010; Sahu and Nath Singh, 2013; Arshad and Ameen, 2018).

8.6 KUTD Services and Library

The following section focuses on the university library's KUTD services, aiming to answer the final research question by identifying the role of the library in providing KUTD services and considering how these should be provided?. The discussion covers the findings emerging

from analysis of the library website, the interview with the librarian and interviews with staff and PhD students.

8.6.1 Service Delivery

The findings of the website analysis are corroborated by those of the interview with the librarian in regard to service delivery, notably that there was inadequate delivery of KUTD services. More specifically, there was no clear information about how the services were provided, no definition of terms, no explanation of the importance of KUTD services, no description of the various approaches or strategies, nor any guidance or help service to facilitate or explain how to use the KUTD services. While acknowledging these deficiencies, the librarian's interview responses sought to justify the limited provision of KUTD services by referring to the adoption of a more open approach involving no unified policy or strategy for providing, supporting and promoting KUTD services, which may also explain the imbalance in providing the service across the different faculties on the website. It appears that the university library tended to consider KUTD simply in terms of individual items of information provided, equivalent to books or journal articles, rather than the provision of a specific service. On the other hand, the literature does not appear to discuss how academic libraries should provide different services in the electronic age or how library services have changed over time. Many studies do, however, emphasize the need for academic libraries to understand users' needs and to ensure that they are aware of the services provided by those libraries (Pedramnia et al., 2012; Raju et al., 2018). The finding that KUTD was not seen as a service that the modern academic library should provide is consistent with reports in the literature by authors who identify a consequent need to deliver a range of such services, to develop effective ways to support them and to inform users at all academic levels of their existence (Catalano, 2013; Korobili et al., 2011).

The following subsections discuss the factors that have been found to contribute to low usage of the library, its website and services. The discussion begins by considering accessibility and usability as factors affecting the use of the university library website, then terminology and misleading language, users' preference for the Google interface, lack of awareness, seeking help from a librarian, poor communication and the absence of KUTD support services.

8.6.2 Accessibility

The analysis of the university website revealed that information about KUTD services was not easily accessible, being scattered throughout the site and involving an assortment of links; similarly, the librarian described KUTD services as hidden by being spread around the website under many different links and identified these issues as needing to be addressed in a future redesign. Consistent with these findings, the literature identifies the accessibility of services and the availability of information as difficulties facing academic libraries (Chaurasia and Chaurasia, 2012; Ganaie and Rather, 2014). Among the specific obstacles that staff are reported to face when searching for information on library websites are the time taken to locate multiple items or materials because of their dispersal across several webpages and links (Khan and Shafique, 2011; Kress et al., 2011; Ge, 2010).

The present study also found that users had difficulty in locating materials because of the multiplicity of sources, each having to be treated differently and requiring its own particular set of steps to be taken to set up alerts. Another complication emerging from the website analysis was the need to open multiple windows simultaneously, each one often requiring a different username and password to be used. Again, this finding is in agreement with many studies in the literature which have identified the availability of information resources as an impediment confronting staff and PhD students (Ge, 2010; Chaurasia and Chaurasia, 2012; Ganaie and Rather, 2014). Indeed, the researcher herself was affected by such difficulties when using the library website, while research participants identified certain related factors as negatively affecting their use of KUTD methods. For example, they mentioned ease of use and ease of navigation in the context of certain methods or webpages involved in keeping updated. This finding is consistent with reports in the literature that library websites are not as easy to use as search engines (Wu and Chen, 2014).

8.6.3 Search Terms and Language

The findings also illustrate that when searching the terms ‘keep up to date services’, ‘content awareness’ and ‘alert services’ were entered in the search box on the home page of the library website, many of the items generated were found not to be relevant to KUTD services. The literature asserts that the use of natural language searching is important in order to identify the correct terms and to clarify the relationships between terms or categories such as ‘finding a book’ and ‘find an article’ (Kupersmith, 2012; Singley, 2014) or ‘periodical’ and ‘serial’

(Alazemi, 2015) and the need to avoid using unclear terms and concepts (Denton and Coysh, 2011; Majors, 2012).

8.6.4 Google and Google Scholar

For all of the above reasons, Google and GS are easier to use than library websites and are generally preferred by users; participants stated during the interviews that they preferred Google and GS because they offered full coverage of information sources and topics in diverse formats and because of their speed, ease of use and accessibility. Consistent with this, the literature suggests that library websites should facilitate the provision of services in a similar way to search engines, ensuring ease of use, full coverage, time saving and convenience (Cheong Choy, 2011; Sahu and Nath Singh, 2013; Connaway and Dickey, 2010; Krawczyk, 2014; Johnson et al., 2016). In earlier studies, users have specified design and usability as the most important factors influencing the decision to use or avoid a library website (Kim, 2011; Johnson et al., 2016). This may help to explain the ways that participants in the present research reported seeking information and using the library and its website, characterized by low usage of KUTD services, as discussed later in this section.

8.6.5 Lack of Awareness

Another factor which may partially explain the low usage of the library website is potential users' lack of awareness of the KUTD services provided by the library. Analysis of the website and the interview responses of the librarian reveal that the library did very little to make staff and PhD students aware of the various KUTD services available and that when users did occasionally ask about these, what was provided was on a very small scale. At the same time, the interviews with academic staff and students reveal that most participants were unaware of the KUTD services on offer and that they identified lack of awareness as the main reason for scant use of the library in general. These findings accord with acknowledgment in the literature of low awareness among staff and PhD students (Al-Muomen et al., 2012; Gibbs et al., 2012) and with reports that the former depend on their personal connections while the latter rely on academic staff and supervisors (Connaway and Dickey, 2010; Haines et al., 2010; Drachen et al., 2011; Liyana and Noorhidawati, 2010). The literature emphasizes that it is important not only to inform users of the various services that academic libraries

provide but also to understand their needs and monitor changes in their perceptions or behaviour (Smith, 2011; Kim, 2017).

8.6.6 Seeking Librarians Help

Another aspect of lack of awareness which led to low usage, according to the findings, was that participants did not know what help or support a librarian could provide, what questions they could ask, or how to approach a librarian. Indeed, it was found that participants tended not to seek the librarians' help at all, explaining that their work was inter-disciplinary or covered many diverse areas, leading them to believe that no librarian would have the specialist knowledge needed to provide information that was relevant. Some participants added that if they did decide to ask a librarian for help, this would entail spending time and effort explaining their particular needs, which would be more usefully spent in pursuing their research by other means. Many studies in the literature similarly refer to librarians lacking the necessary specialist knowledge and to users being unsure about their working hours and about the kinds of information they could be asked to provide (Sloan and McPhee, 2013; Rempel, 2010; Liu and Winn, 2009; Korobili et al., 2011).

8.6.7 Poor Communication

In addition to the lack of awareness discussed above, the findings show that participants had restricted perceptions of the library as providing only general background information and books on broad fields of scholarship, or simply as a large room filled with bookshelves where the materials stored were likely to be out of date or of value only to undergraduate students.

This negative impression and the aforesaid lack of awareness may both have resulted from poor communication between the service provider and benefit owners. In support of this conclusion, the librarian mentioned in interview the need to gather more information about users and their needs. A second aspect of the communication failure reported by the librarian was that the library received very limited user feedback, mostly comprising comments on more general issues rather than on KUTD itself, leading library staff to make the false assumption that academic staff and PhD students were satisfied with the services currently on offer. The librarian also expressed an interest in identifying more effective means of eliciting useful feedback from these users and collecting more valuable information on them and their needs.

The findings on low awareness of KUTD services provided by the library, ignorance about the librarian's role and the desire of the librarian to gather more useful information about users all constitute good evidence of a breakdown in communication between the library and its users which needs to be addressed in future.

8.6.8 Support Services

Analysis of the library website and of the librarian's interview responses reveals no evidence of the provision of KUTD support services such as an online service desk that would allow users to ask questions, seek advice, raise concerns, offer feedback or make suggestions about KUTD services. This deficiency in support services can be considered to constitute yet another aspect of the poor communication between the library and its users. Conversely, offering such services would help the library to understand more about users' KUTD needs and provide the opportunity to evaluate and maintain the existing services. Thus, the literature indicates the importance of a clear strategy to evaluate, improve, maintain and dispense services that match users' needs (Hossain Shoeb, 2011; Korobili et al., 2011; Khan and Bhatti, 2012; Cheong Choy, 2011).

8.6.9 Service Engagement

One element of service engagement is the provision of training sessions. Analysis of the library website and the librarian's interview responses reveal that no online or offline training sessions for KUTD services were offered and that the library offered only general training sessions on setting up alerts or which databases to use, unless staff or students were struggling and requested help, in which case the library would offer one-to-one sessions. Even then, most of these tended to be relatively generic, rather than being focused on KUTD services.

When questionnaire respondents were asked if they had ever attended any training courses on KUTD services, whether provided by the library or available on line, the majority replied that they had not done so. At the same time, most participants identified attendance at training sessions on KUTD tools and services as a useful way to improve their ability to KUTD. The literature asserts that a lack of training results in poor skills in searching and locating information sources (Pontis et al., 2015) and that even users who had had limited access to training sessions reported discomfort when using library resources (Blummer et al., 2012;

Tomaszewski and Libraries, 2012). Therefore, the literature suggests providing more personalized training sessions that can support researchers at each stage of the research lifecycle (Brown et al., 2015; Kim, 2011). While there is limited discussion of training in the literature, there is an emphasis on understanding users' needs and providing the types of training sessions that they require to ensure the acquisition of essential skills for searching and retrieving appropriate information sources (Ganaie and Khazer, 2014; Khan and Bhatti, 2012; Delaney and Bates, 2018; Daland, 2013).

The previous section ended with a discussion of the different aspects of the library's provision of KUTD services, reflecting the absence of a clear role or strategy for academic libraries in the electronic age as regards providing their services in general and KUTD services in particular.

Academic libraries have a very clear strategy on providing access to information resources so that their users acknowledge the benefit gained from the accessibility of information. Many interviewees identified access to information resources as the main advantage of the library and stressed the importance of continuing to provide it. The findings of the current research on this matter are in line with many studies in the literature which consider the accessibility that academic libraries offer to their users to be very important (Tenopir et al., 2012b; Rempel, 2010; Wu and Chen, 2012; Yan and Davison, 2013; Borrego and Anglada, 2016).

8.7 Research Limitations

The findings of the current research have the potential to improve the searching and seeking behaviour and KUTD practices of PhD students and staff. In addition, they may clarify the role that academic libraries can play in improving the skills needed for searching and retrieving information from diverse sources to meet the daily challenges brought by the information explosion. Finally, it is hoped that the findings will augment the existing literature on information seeking and academic libraries in learning environments.

Nonetheless, several limitations of the research must be mentioned. The first of these concerns the questionnaire sample. Great care was exercised in selecting and recruiting the participants in ways that would avoid putting undue pressure on anyone, given that all potential recruits were likely to be very busy with multiple tasks related to their responsibilities as professionals, academics and students. With this restriction in mind, several factors were considered in order to motivate people to participate in the questionnaire

survey, as mentioned in (Section 5.10 on Response Rate). The eventual total of 207 responses can be considered a decent sample size; however, there was a preponderance of PhD students among the participants, while relatively few academics in higher positions took part. The sample was also skewed towards the Engineering faculty compared to Sciences and Humanities, while the very small number of responses from members of the Business faculty made it inappropriate to include them in the analysis. Therefore, valid generalisations cannot be drawn concerning similarities or differences among faculties and further investigations are needed.

Generalisation is further limited by the fact that the research data were collected from members of just one Scottish university. It will be important for future research to include participants from other Scottish universities, other regions of the UK or other countries. For example, doing a comparison studies with different geographic regions and try to understand how the geographic and culture factor can affect the KUTD practices such as comparative study Glasgow and Edinburgh or new study to compare UK with Saudi Arabia for example. These studies help to gain a broader understanding of which methods or strategies are most efficient for students and academics to keep abreast of developments in their fields. In addition, understanding more about other universities, libraries or academic environments will extend the usefulness of the current research findings and all related recommendations for library practice in KUTD.

Another limitation of the research is its reliance on self-reported data, which amplifies the risk of bias in the conclusions which were drawn as to how individual differences appeared to motivate KUTD behaviour. If future research is to achieve a better understanding of the main obstacles to keeping up to date, there will need to be a more thorough analysis of the behaviour of students and academics who engage in a low level of KUTD activity, based on more reliable data-gathering methods.

With regard to the KUTD methods examined in this research, asking participants what methods they used and subjecting these to analysis met a further limitation, namely that choosing the most appropriate test to analyse a number of diverse methods was challenging. The best approach might be to identify these methods by asking participants which methods they most often use to KUTD, then subjecting all of these to analysis. A limited number of methods could next be investigated at greater depth and libraries informed of the results. Such future studies, requiring deeper and wider participation of the kind outlined above,

would generate findings to enrich the role of libraries and facilitate the design of tools or software that would better serve the needs of individuals.

The focus of the research was the effect of the independent variables of age, gender, experience, position and faculty. Given the limited information available on the topic of KUTD, these factors were selected at the outset as having the potential to affect the usage of KUTD tools. Other factors, such as searching skills, technological skills, the speed of changes in the field concerned and job satisfaction or even considering another library strategy services or information system and how information follows in the university, ought now to be investigated in order to provide a more comprehensive coverage of the various aspects of KUTD than was possible in the present research, where restricted time made such further investigations difficult.

Many participants stated that they had never thought deeply about the topic of KUTD before taking part in this research. It may be that their knowledge of KUTD was implicit and thus difficult for them to retrieve. Barry (1995), who studied academic researchers' use of electronic sources of information, found that much of their knowledge was indeed implicit, concluding that it is not always possible to subject one's own information activity to conscious scrutiny; instead, participants may have engaged in post-rationalisation to justify guesses or assumptions about their actions.

Two final limitations are worthy of note in connection with the use of interviews to complement the questionnaire survey. It would have been better to select a pool of interviewees more representative of participants in different positions and from different faculties. In reality, the interview sample was severely limited by its reliance on volunteering as the approach to recruitment. Finally, the use of mixed methods, while potentially very beneficial in delivering a breadth of understanding of research phenomena, can be time-consuming and in the present research required too much effort and hard work.

8.8 Recommendations

This section makes some recommendations designed to facilitate the provision of better KUTD services and the establishment of best practices for both staff and PhD students. These recommendations refer to the library website, the roles of the library and librarians, of the university and its various departments and schools. If followed, they would be expected to improve the current situation of KUTD in general. It may be concluded from the discussion

of the present findings that KUTD is the shared responsibility of the service provider and benefit owners. Therefore, a sharing of effort, roles and responsibilities among all stakeholders is required to deliver the right information to the right users at the right time.

8.8.1 Recommendations for the Library Website

- The library website should be redesigned and updated with a user-friendly interface, making it easier to use and navigate.
- The use of very clear terminology on the website would help to avoid misunderstanding.
- The use of natural language would help users to identify their needs and make correct choices.
- Identifying the most important search categories very clearly would make them easier to find.
- The provision of algorithms to rank searches would help users to find relevant items.
- The website should provide more filtering options, such as by field, year or type of information item.
- A simple icon should link to a page dedicated to full information on KUTD services, thus increasing awareness, usability and findability.
- The KUTD services page might also offer access to related information, such as subject librarians, sources, terminology and training.
- A detailed guide to services could cover methods such as setting up alerts or activating KUTD options for databases or TOCs.
- An online form should allow users to set up personalized KUTD services, e.g. specifying which alerts to receive and how often.
- Such forms could be linked to users' library accounts, thus opening a variety of KUTD services to customization.
- The website should offer full support services, such as an online KUTD help desk.

8.8.2 Recommendations for Librarians

- All forms completed by users should have an option to seek a specific type of help from a librarian.

- Subject librarians should offer individual guidance on items, methods, specific needs and options to find the most relevant information.
- Library accounts could be linked to university or social media accounts for users who wished to have everything in one place.
- Librarians could ensure users' satisfaction by engaging with them via online chat or videos.
- Welcoming users' feedback on KUTD services would improve their quality, increase awareness and strengthen communication.
- By exchanging experience with users, librarians could identify best practice, then add it to the KUTD webpage for further feedback.

8.8.3 Recommendations for the Library

- The library should communicate with users to assess their information needs and decide what KUTD services and resources to offer.
- Librarians should join departmental research teams, both to learn how to improve the focus and quality of services and to raise awareness.
- Staff and students in each department could be asked to volunteer to advise the library on their needs.
- Social events could promote the library's work and strengthen the exchange of knowledge and expertise about best KUTD practice.

8.8.4 Recommendations for Training

- Having identified users' needs, the library should offer training in the essential skills of searching, retrieving and filtering information.
- Practical KUTD training, online and offline, should focus on effectiveness, efficiency, selectivity and avoiding duplication.
- Training sessions should cover using TOCs and setting up alert services, including email alerts for databases and journals.
- Sessions should reflect each group's needs, e.g. training students to read titles, abstracts, headings etc. to assess relevance.
- Students should also be trained to judge the quality of information in journal papers from citations, references, impact factors etc.

- They should learn to seek and locate diverse sources, e.g. online theses, data, figures and diagrams.
- Students should learn to create accurate keywords, to narrow down a search and to use advanced techniques and Boolean logic.
- Staff should be trained to deal with information overload and to combine research strategies to suit the field, their work and research needs.
- Staff training should broaden their KUTD scope beyond reading papers in their field.

8.8.5 Recommendations for Staff

- Staff should encourage students to use the library and seek a librarian's help.
- They should ask PhD students to provide a list of keywords and concepts commonly used in their field.
- Staff should also ask PhD students to identify key journals, databases and authors, and to situate their research within the field.
- These steps, before and during students' research, would broaden their KUTD and enhance staff-library collaboration.
- Staff could suggest information sources at the beginning of the academic year, to ensure that the library could provide them.
- Staff and librarians should collaborate to teach students to set up services, assess their progress and improve their KUTD.
- Regular communication channels between academic staff, library staff and librarians would allow discussion of all aspects of KUTD.

8.8.6 Recommendations for the University

- The University should embed training on KUTD services in the Research Development Programme (RDP).
- RDP training could cover KUTD tools and methods and could include staff members and librarians, addressing individual needs.
- A KUTD webpage could list seminars, workshops etc. across the university, linked to the academic calendar and individual accounts.
- This page could provide a weekly digest of KUTD-related events, policies and news in departments, the library and elsewhere.

- The profiles of academic staff and PhD students should be updated regularly and linked to the University's KUTD page.
- The University could create mailing lists by interest or field, sharing data to facilitate collaboration within research areas.
- These recommendations should be overseen by a diverse, periodically refreshed committee of staff, librarians and students.
- The University should encourage the exchange of information by departmental research groups, accessible online to all.
- Collaboration and knowledge-sharing within departments should be facilitated around drinks dispensers, recycling bins etc.

Chapter 9: Conclusion

9.1 Research Conclusion

The current research can be considered novel in many ways. Firstly, previous discussion or investigation of KUTD has generally been limited to a former time when it was a service provided by academic libraries. Secondly, previous studies have rarely examined KUTD as a service and behaviour at the same time. Thirdly, the current research focuses on all potential methods, tools, approaches and modes of KUTD, many of which are newly discovered and have not been discussed in the literature before. Finally, it has investigated KUTD among staff and PhD students at the same time, using mixed methods in a case study of Strathclyde University. Therefore, the current research extends the scope of the field by addressing new dimensions of ISB related to information literacy and academic library services.

The main original contribution of the present research is in identifying the range of behaviours, modes and approaches that staff and PhD students can use to keep abreast of relevant developments in their respective fields. The KUTD model identifies behaviours such as searching, browsing, monitoring and chaining, which can be conducted either online or offline, whether actively or passively. It thus helps to evaluate all possible methods by identifying the behaviours that staff and PhD students use most often in order to KUTD. Participants were found to rely much more on active online searching and browsing than on alert services and other passive monitoring methods. Another method that they tended to use very little was chaining, both active and passive.

With regard to KUTD methods, the current research provides valuable data on factors potentially affecting their use and users' motivations. For example, older, more senior and higher ranking participants generally relied more on PE and AT than did their younger and more junior counterparts. Conversely, younger participants with less experience were more likely to use SM and LS, albeit at a relatively low level of usage overall.

With regard to library services, the present research has developed guidelines on the best ways for an academic library and its associated website to support academics to KUTD.

These guidelines indicate how such a library can facilitate these users' interactions, ensure the quality of their experience and satisfy their KUTD-related needs.

KUTD is a set of behaviours that individuals can adopt to keep abreast of developments in their respective fields. These behaviours can at one extreme involve action taken during any type of submission of information such as submitting a paper, attending a conference, giving a presentation, writing a research paper or other forms of knowledge contribution that involve information sharing or dissemination. All such actions represent active ways of seeking or searching for information, whereas in the passive mode, individuals tend to KUTD in a less active way, simply waiting to encounter information or for serendipitous discoveries to occur.

KUTD is a behaviour keeping individuals aware of general knowledge on any topic, of trends in any field and of related concepts and language. For example, people KUTD with information, conferences, methods, tools, advanced technology and news. This involves knowledge sharing and knowledge contribution, making it similar to following the daily news on television or some other medium, where individuals are updated on many different topics. To KUTD a person must have access to all of the basic information in a field in order to build knowledge and understanding of that field.

Information seeking can be seen as an aspect of KUTD. However, it is limited to gathering information to answer specific questions. KUTD, by contrast, involves building up layers of advanced knowledge in an incremental rather than continuous process. Therefore, it is important to begin by understanding the basic information in the field. People who do not command fundamental concepts, facts and information will be unable to determine what constitutes an improvement or in which direction improvements are needed. Therefore, it is important to suspend KUTD activities periodically in order to absorb the information already gathered and to deepen one's understanding of it. This process will facilitate an informed decision on what future direction to take, by illuminating the research landscape and the place in the broader historiography of the field occupied by the existing studies.

Two main factors making KUTD difficult nowadays are the sheer quantity of information and its wide dispersal. Hundreds of papers are published every day, news operates on a twenty-four-hour cycle and individuals may receive many posts every minute. However, it is not necessary to know everything at all times. It is more rewarding to have a general understanding of a topic before focusing on the significant detail. Much published research is fairly repetitive, making it essential to selectively identify key contributions to knowledge.

Individuals must also be able to identify their limitations and seek help if needed. They should develop an instinctive ability to judge quickly what to read (e.g. an abstract rather than the whole paper) and what to ignore. This will include judgements of the relative quality of information sources and of their relevance to individual information needs.

The above shows that successful KUTD involves significant learning and individuals can certainly learn through a combination of better practices, habits, general experience and intuition. By repeating these steps over an extended period, individuals will eventually come to understand how best to allocate their time. They will save time and effort by creating sets of tools, methods and information sources to consider whenever they need to KUTD. The overall KUTD process is so extensive and complex that individuals must focus their efforts very carefully. Selectivity and concentration are essential to ensure that attention is directed to the most productive practices and to the most valuable information.

Individuals differ widely in how they KUTD and in their information seeking and searching behaviours. The many variable factors underlying these differences include motivation, the task undertaken, the type of information needed, the level of knowledge, the choice of tool, the time available and familiarity with the research area. The combined effect of these variables is that KUTD cannot follow a set formula. A great deal of trial and error will be necessary to establish effective KUTD practices, with more experienced practitioners achieving better results.

Thus, PhD students will begin by experimenting widely to determine what works for them, ending with a comfortable set of practices that lead them to the right information as a result of natural progression. This process will start by understanding the literature, identifying the research boundaries, building up the research language and learning incrementally to judge the relevance to their own needs of particular sources, methods and search results. On the other hand, academic staff will already have extensive knowledge of their field. This deep understanding will enable them to select and efficiently use the ideal tools or methods to suit their information needs, depending on their experience and personal communications.

In order to KUTD, individuals need to depend on both people and technology. Of the two, people are considered a better source of information, consistent with the Socratic principle that people are the best source of knowledge creation, knowledge sharing and the exchange of ideas with others (Remenyi and Griffiths, 2009). Interacting and communicating with other can enhance general understanding and gaining the valuable experiences in any field or

topic which can lead to the advanced knowledge. This type of knowledge will allow individual to judge the quality of information and be selective by choosing the high quality information despite the overwhelming quantity of information sources that is out there.

KUTD services involve two parties, namely service providers and benefit owners. The former should identify users' needs and provide services that match these. They should also make users aware of the range of services offered and facilitate engagement with them. Therefore, there is a need for tools allowing service providers to systematically assess new or continuing needs. For their part, benefit owners must be aware of the available services and use them appropriately, providing feedback and seeking help when needed.

KUTD is thus ultimately a shared responsibility, requiring libraries and their users to work together. The library has an important role in making individuals aware in detail of the information resources and tools available and in steering them towards the most valuable information. It can also suggest alternative searching strategies that other people have used to achieve the desired result. It is then up to individuals to use the services to search for the specific information they need to KUTD. They must take responsibility for managing their time so that they are able to read, assess, understand and use that information efficiently.

9.2 Future Work

Despite the limitations acknowledged in Chapter Ten, the current research has demonstrated a valuable approach to improving both existing KUTD practices and augmenting the related literature. It is hoped that the findings will play an important role in shaping future work on KUTD practices and methods. They also have the potential to improve guidance for KUTD training, providing a useful framework for the consideration of different aspects of KUTD that can help in the design of improved methods and tools. The following suggestions for future work are made in addition to those discussed in Section 10.7 on limitations.

- It would be useful to conduct an international questionnaire survey on KUTD to compare methods, tools and behaviours in similar fields or departments in order to improve knowledge and understanding of similarities and differences among nations and to identify the factors underlying this diversity.
- The current research was limited to staff and PhD students, so future research should consider other users of academic library websites, such as undergraduates and

master's students, comparing their KUTD practices with those of staff and PhD students.

- Another area for investigation would be the factors that can affect KUTD and which need to be considered, such as the rate of change in a given field or the nature of the field and how these might affect KUTD behaviours.
- It would also be useful to investigate when to consider information out of date or obsolete and to determine the timescale on which information or data should be renewed or updated in any field.
- An important area of investigation is how individuals can establish the habit of KUTD and how this habit can be converted to a practice or woven into everyday routine in the electronic age. A related question worthy of exploration is how KUTD practices have changed over time, with particular reference to electronic means.
- A fundamental topic of study would be the different behaviours of individuals when searching actively for information, including which approaches or tools are found to be the most effective ways to KUTD.
- An additional area worth investigating is how the behaviours of reading and searching for information can affect KUTD practices.
- Future work should seek to identify ways of measuring to what extent individuals are updated in general and to determine how they can update themselves with new methods, tools and practices that can be used to KUTD with information and data.
- Another valuable line of research might be to explore how encountering information, serendipity or the adoption of a passive approach can support KUTD, or to compare the passive and active approach directly to determine which might lead to better KUTD practices.
- With regard to the library and KUTD services, further investigation is needed to understand more about the measures that university libraries should take to ensure the provision of excellent KUTD services. In particular, such research should consider how libraries can establish clear strategies for KUTD services within their budget constraints, providing better services at lower cost.
- Finally, there is scope for investigation of how to keep abreast of news and everyday information in academic and non-academic fields, selectively focusing on high quality material despite the overwhelming quantity of information currently available. Such work could also examine the effect on KUTD behaviour of information overload.

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Appendixes

Appendix 1: Gender and ISB

Author(s), date	Scope	Sample	Location	Data collection methods	Key findings
Male advantage					
(Lorigo et al., 2006)	Gender differences in searching for information on Google.	36 undergraduate students	Northeast USA	Eye tracking	1-Males tend to look at abstracts and take a linear approach 2-Task and gender influence choice of search behaviours
(Young, 2000)	Important factors influencing computing skills and computer skills	462 middle and high school students	USA	Questionnaire	1-Greater confidence among males 2-Perception of computers as a male domain supported by males and rejected by females.
(Large et al., 2002)	Searching for information on the Web to support class assignment in a collaborative environment	53 grade six students in a Canadian elementary school	Canada	Questionnaire	1-Boys are more active on the Web than girls 2-Boys use different research strategies to retrieve information
(Roy and Chi, 2003); (Roy et al., 2003)	How students use the Web to search for, browse and find information about a specific prompt (how mosquitoes find their prey).	14 eighth-grade students with an equal number of boys and girls		Observation by experimenters (one male and one female) in school computer laboratory	1-Males perform better than females in target-specific information measures 2-Females' searching behaviour tends to be more reliable and independent than males'
(Liu and Huang, 2008)	Gender differences in an online reading environment	203 undergraduate and graduate students	Zhongshan University, Guangzhou, China	Questionnaire	1-Males tend to read online and females in paper format 2-Males take a non-linear approach and females a linear one

Author(s), date	Scope	Sample	Location	Data collection methods	Key findings
(Chen and Macredie, 2010)	Web interaction and human factors such as gender, prior knowledge and cognitive styles			Review of empirical studies	<ul style="list-style-type: none"> 1-Males have lower levels of computer anxiety 2-Males achieve better outcomes in using computers 3-The major gender differences are in navigation patterns, attitudes and perceptions.
(Liaw, 2002)	Relationship between computer attitudes and Web attitudes. Gender differences in attitudes towards using computers and the Web	263 students	School of Education, Seattle Pacific University	Questionnaire	<ul style="list-style-type: none"> 1-Males more positive toward computer and Web technologies 2-Students with more computer experience have positive perceptions
(Koohang, 2004)	Effects of factors such as age, gender and experience on students' attitudes to using digital library to write assignments	154 students enrolled in an undergraduate hybrid programme in management at a medium-sized university	Midwest, USA	Questionnaire	<ul style="list-style-type: none"> 1-Males have positive perceptions of digital library use 2-Females have difficulties and low confidence in using learning environment
(Li and Kirkup, 2007)	Differences in use and attitudes toward the internet and computers among Chinese and British students, and gender differences in this cross-cultural context	220 Chinese and 245 British students	China and UK	Questionnaire	<ul style="list-style-type: none"> 1-Males tend to play more games 2-Males in both countries are more self-confident in their computer skills 3- Greater gender differences in British group
(Peng et al., 2006)	University students' self-efficacy, perceptions and attitudes to the internet	1417 university students	Taiwan	Questionnaire	<ul style="list-style-type: none"> 1-University students have positive attitudes to the internet 2-Students see the internet as a functional technological tool 3-Males have more positive attitudes toward internet use 2-Males perceive the internet as a toy; females as a tool

Author(s), date	Scope	Sample	Location	Data collection methods	Key findings
(Kennedy et al., 2003)	Gender differences in internet use	47,176 adults	North America	Questionnaire	1-Females tend to use the internet for social reasons; males for entertainment 2-Social factors and gender roles can affect internet use
(Karavidas et al., 2005)	Effects of computer anxiety and computer knowledge on self-efficacy and computer use	222 adults aged 53-88 years	South Florida	Questionnaire	1-Males and females use computers at the same rate 2-Females report more anxiety and less computer knowledge 3-Males use computers more

Author(s), date	Scope	Sample	Location	Data collection methods	Key findings
(Schumacher and Morahan-Martin, 2001)	Gender differences and relationships among internet and computer experience, skills and attitudes	619 undergraduate college students of Institutional Technology Department in 1989 / 1990 to 1997		Questionnaire	<p>1-Students had more experience over time</p> <p>2-Males had more experienced in programming and games</p> <p>3-Males spend more time online than females</p>
Female advantage					
(Kim et al., 2007)	Gender differences in the context of online travel Website	1334 qualified respondents obtained from Internet Tourism & Travel 2001	North America	Questionnaire	<p>1-Females consider higher values for online and offline information sources when choosing travel destinations</p> <p>2-Females tend to be more exhaustive and elaborative in external information searches</p> <p>3-Females tend to use more computer-mediated communication</p>
(Halder et al., 2010)	Effect of gender on ISB	600 university students	West Bengal, India	Questionnaire	<p>1-Females interact with much more information than males</p> <p>2-Females value information; search and use wide range of information categories</p> <p>3-Males are broader in information searching</p>
(Steinerová and Šušol, 2007)	Library users, information use and gender perspective	16 academic and research libraries with 793 subjects, especially students and educators	Slovakia	Questionnaire	<p>1-Females tend to cooperate; males tend to work individually on Internet</p> <p>2-Males tend to use free electronic resources whereas females use more authorized ones</p> <p>3-Females are more patient in information seeking</p>

Author(s), date	Scope	Sample	Location	Data collection methods	Key findings
No gender differences					
(Hong, 2002)	Relationships between individual differences (experience, gender, age, scholastic aptitude, learning styles) and perceptions of a Web-based course.	26 students on a compulsory MSc course (Human Resource Development)	Universiti Malaysia Sarawak	Questionnaires and faculty records	No relationship between gender and course satisfaction or learning achievement
(Drabowicz, 2014)	Influence of gender on access to ICT among contemporary adolescents	Information on ICT usage in 39 countries		Questionnaire	1-Males tend to use internet more 2-Females tend to use internet for communication; males for entertainment 3-No overall gender difference except in manner of using the Internet
(Zhou, 2014)	Gender differences in online information seeking	107 students	South China	Questionnaire	1-Gender differences diminishing among skilled and unskilled in Web use 2-Perceptions of Web use and navigation similar among females and males
(Tsai and Tsai, 2010)	Gender differences in internet self-efficacy and internet use	936 junior high school students	Taiwan	Questionnaire	No gender difference among younger students in using internet
(Van Deursen et al., 2011)	Effects of gender, age and education on medium- and content-related internet skills	109 participants	Twente, east Netherlands	Questionnaire	No relation between gender and internet skills
(Fallows, 2004)	Gender differences in internet use	1358 adults	USA	Questionnaire	1-Both male and female use the internet but tend to use it in different ways: males for information gathering and entertainment; females more for communication
(Hu et al., 2012)	Gender differences in perceptions of internet use	805 business students	Research university, USA	Questionnaire	No gender differences in perceptions of ease of use of Internet

Author(s), date	Scope	Sample	Location	Data collection methods	Key findings
(Urquhart and Yeoman, 2010)	Potential gender or sex differences in information behaviour research			Meta-synthesis	1-Females are active seekers 2-Females prefer approachable information resources 3- No gender differences in information seeking and use
Gender as a Factor					
(Erfanmanesh, 2016)	Effects of gender, level of study and age on information-seeking anxiety	375 postgraduate students		Questionnaire	1-Gender affects information-seeking anxiety 2-Females report high level of information-seeking anxiety compared to males 3-Females tend to use university library less than males
(Funmilayo, 2013)	Gender differences in use of academic resources in university library	600 respondents	Federal University of Technology, Akure, Nigeria	Structured interviews	1-Information-seeking capacity (library visits) of females reduces with age 2-Single females visit the library more; equal distribution of married and single males 3- Young females visit the library more
(Cheng et al., 2012)	Personal, behavioural and environmental factors in an online activity; relationships among gender, learning performance and online behaviour	105 junior college students majoring in Information Management	Taiwan	Online question-answer discussion activity.	1-Males ask more questions and females reply to questions more 2-Females tend to have more social interaction and communication behaviour 3-Females tend to ask comprehensive questions; males tend to ask administrative and factual ones
(Jansen and Solomon, 2010)	Effects of gender in analysing performance of sponsored search advertising	7,000,000 data records	USA	Log files	Gender orientation of the key phrase is a significant predictor of behaviour and performance

Author(s), date	Scope	Sample	Location	Data collection methods	Key findings
(Magherat and Stock, 2010)	Gender differences in using general search engines and specialized deep Web tools	45 students of information science	Heinrich Heine University, Düsseldorf, Germany	Questionnaire	<p>1-Males tend to use databases more than females</p> <p>2-Females tend to use more operators in formulating search queries</p> <p>3-Males get search findings accidentally; females do more targeted searching</p>
(Singer et al., 2012)	Gender effects on search engine research tasks	60 volunteers	Germany	Laboratory experiment	<p>1-No gender difference on simple research tasks</p> <p>2-Greater gender differences on complex tasks</p> <p>3- On complex tasks, female spent less time on search engine results pages</p>
(Allen, 1995)	Gender differences and attitudes to use of intra-organizational email system	192 employees		Questionnaire	<p>1-Females use email more effectively than males</p> <p>2-Females tend to rely on coworkers in learning to use email</p>

Table 30: Studies on the Impact of Gender on Information Seeking

Appendix 2: Email to University Librarian (Invitation to take part in the research interview)

Hi Elaine,

I'm Nouf, a PhD student at Strathclyde University. I'm not sure if you remember me – I'm sure you meet loads of students every day. Anyway, I met you when I was asking for help to set up content awareness services (CA) in the library. I'm writing to ask for more help, as I'm researching content awareness and would be really grateful if you could take part in an interview about the CA services which the library provides?

In short, my research topic is about how to staff and PhD students keep up with the latest developments in their field. I need to find out about the different services, tools and strategies that the library provides for staff and PhD students in order to understand how to develop the framework and potentially improve CA services across universities.

If you have the time to take part in my research, the meeting would take an hour and could be at a time and place of your choosing. All information provided would be confidential and completely anonymous. I'd also like to record the interview for my own benefit – in case I need to re-listen to anything because languages barrier. Any recordings would be deleted.

Please let me know if you do have the time to take part and we can arrange a time and date for the interview. If you can't, I'd still like to say thanks for your time and help in the library, and for reading.

Kind Regards,

Nouf

Appendix 3: Librarian Interview Transcript

Participants:

(I): The Interviewer, Nouf Alshareef.

(P): The Participant being interviewed, Elaine.

(X): Professor Ian

(D): Dr Diane.

Transcript Conventions

From: Tolson, A. (2006). *Media talk*. Edinburgh: Edinburgh University Press.

NB: Inverted commas have been used to identify conventions that are quoted from Tolson (2006: 23).

- () 'If empty, indicates unclear portions of text.'
- () If not empty, graphemes or lexemes indicate the transcriber's best guess at an utterance or the orthography of an utterance.
- Occurring following graphemes, this indicates an uncompleted word, according to the transcriber's best guess.
- = 'Indicates that utterance follows immediately on previous utterance, or is latched to separate parts of a continuous utterance by the same speaker.'
- ['Indicates the point at which overlap with another speaker begins'.
-] Indicates the point at which overlap with another speaker ends.
- (()) Indicates comments by the transcriber, such as descriptions of paralinguistic features.
- ((laughter)) Indicates audible laughter from more than one person.
- ((laughs)) Indicates audible laughter from one person.
- [.] Indicates a noticeable pause of more than 0.5 seconds.
- ? Indicates that a speaker cannot be identified
- ?? Indicates that multiple speakers cannot be identified

Transcription Notes

- The transcription, to the best of my knowledge, is intended to be an accurate representation of utterances. Any mistakes in transcription are acknowledged as the fault of the transcriber and are not intentional.

- Conventional punctuation marks such as commas, full stops and capitals to mark sentence beginnings are not used as spoken English does not follow the conventions of written English, therefore it is impossible to know where a speaker's sentence starts or ends.
- Pauses have not been annotated due to a lack of precise software which would accurately allow this.
- No fillers were transcribed as these were not relevant to the study. These include /ʌ/, normally represented by 'uh'; /ɜ:/, represented by 'er'; /ɜ:m/, represented by 'erm' and /ʌm/, represented by 'um'.
- Choices regarding the presentation of contractions were made, where both /jənəʊ/ and /ju: nəʊ/ are represented as 'you know', as no standardised version of the contraction of 'you know' exists. Comparatively, since there is a standardised form of the contraction of 'going to', when audibly a contraction this was represented as 'gonna'.
- Overlapping speech which constitutes words or sounds representing back channelling (which a listener gives a speaker to show that she/he is listening or understands), such as 'right', 'ah ok' or 'yes', have not been annotated

Participant Transcript of speech

I ok so the first questions for example I want to at the beginning to provide a definition for the CA in order just to check that you know both of us have the same perspective about the CA so the CA is the recognition or the discovery of new information about data trends by following direct strategy to encounter information and then keep you up to date in a regular basis now this recognition as I I mention here in my diagrams have different types of the CA so I have searching monitoring browsing and chaining and all of these can be offline and online at the same time so I just want to check do you have other defines do you agree with this define or how do you define it in your own opinion

P content awareness wasn't a term that I was familiar with I was familiar with the term current awareness I'm wondering if content awareness is maybe a more modern or newer term that encompasses other aspects of keeping up to date content awareness I was thinking about providing information about new resources (and) content research for staff and students so I'm wondering if content awareness is maybe a broader term or as I say it's maybe a more up-to-date term

I just you know it's more about involving the online and offline aspects of the the keeping up-to-date so it's just about what is available on for example on

the digital environment it's also the meeting the the let's say the conference attending group discussions all of these things (in one packet) it's also consist of combining different tools together so not using one tool only email alert or RSS no I can combine email alert with social media for example and all that stuff

P right ok that's fine

I so you mentioned that the definition that you have is about current awareness

P that's the kind of general term in the literature certainly when I was studying at library school but as I say it may have changed over over time

I ok I see that is lovely ok in terms of the delivering of the services I want to know what content awareness services does the library provide

P Right I don't know if you'd define it as a service as such but we do some things to keep people up to date about what's happening in terms of new resources and new information that's relevant to them [...] a number of the subject libraries send lists of publications in the area to staff then staff can select things that they want to order [...] so this might be electronic it might be emails that they send it could still be paper lists that they send as well most of the time it will be electronic lists they're sending to people and then they can then choose publications from that and then we can order [...] so rather than the staff having to find things and then order them we're kind of directing them towards what might be relevant and it varies from subject to subject because some staff maybe in like computing and information studies you may be quite used to doing that yourself but maybe in other areas maybe humanity areas (when) there's a lot of material to go through the librarian may be filtering it a bit before sending it out it makes it a bit easier for people to choose publications

I ok I see

P we also just email if we get new content into the library so if we get new books or new journals or new databases new e-book packages then we often email the library (reps) each of our departments has a representative who looks after that particular department so in CIS it's David (McMenamy) he's their library rep but all of the departments in the university have one who's the kid of liaison point between the department and the library so a lot of the

information is channelled through that one person and then they will then channel it on in whichever manner they feel appropriate [...] some departments might have a staff newsletter that goes round some might use email lists some might have a Facebook or a blog or something like that but if we send the information to the reps they can then decide what they want to do with it after that [...] we run a new books report every month and again some subject librarians send this out I've not found that my library reps particularly needed to have it so I tried it for a short amount of time but they didn't really need to know and I think they were finding out themselves kind of what new books had been added [...] again it's on a subject by subject basis some subject areas may require that more so it's just a report we get from the catalogue and then we can send out the new books that have appeared the last month although when we get our new library management system it's likely to be able to do this so I think people will be able to do this for themselves find out new books that have been added and it'll be easier that just having to sort the content by date [...] be an easier way to do it [...] what other things have we got we've got a page on the website (but) I do think it's a bit hidden it's called what's new ((laughs)) but I think trying to find it's probably the problem to start with although we are going to be redeveloping our website in line with the university brand so that is something that will be happening at some point and on the what's new page we put new electronic resources that are relevant [...] it's mainly databases it's some e-book packages occasionally journals although most of the journals tend to go out via other means you know to the library reps and this is updated fairly frequently whenever we get anything new we also put details of trials up there so if we're trialling a new e-book package or a new database we'll put it up on that page as well as making people aware of it by email or word of mouth [...] what else do we h- the (Hass) librarian says she has a coffee and conversation group ((laughs))

? ((laughs))

P which I think I need to start one of those (I) like the sound of that ((laughs)) and she says this is an informal group that meets now and again and in fact she was just meeting in that afternoon when I asked her what she did ((laughs)) and she just gets together with people in that faculty so it's just an

informal people can come along chat find out what's happening in the library what's happening in terms of content and they can ask questions so it's a bit of a social get together and I suppose she finds a bit a bit about what's happening in the department as well so it's a two way so it's not a formal thing it's quite an informal group [...] we meet new staff through the market place I know you came to the market place (I) got your name from that Diane ((indicates Diane)) ((laughs)) at one point and we're given a list in the library of new staff in the market place so we can then target these staff in any way we choose ((laughs)) it's () mainly to introduce them to the library it's just to give them a nice welcome message and if they want to meet us and if they then decide ok I want to find out about research in my area or what can you tell me about new publications then we can set up a something with them so I suppose the onus is on the new member of staff to then contact us and say what they would like from that if anything [...] we do have Twitter and Facebook but I don't think we use it that much for content awareness and I think that's something we could do more of in future

I can you tell me why is that you think it's (that) way

Partly because it's very [...] it's one person who looks after our Twitter feed and our Facebook page so everything has to go via that person so you have to kind of remember to do it it's not an automated thing so you'd have to remember oh we've got this new book we've got this new service I must remember to tell (Emily) to put it up on Twitter so we can't just go ahead and do it we've not got the facilities to do that centralised centralised (that would be the message) Twitter feeds centralised Facebook page yes I think social media we could be doing more there in future [...] we do advertise the courses Yes I did see and there is also some skills [boost]

[skills] boost sessions those were put up there sometimes if we have problems a service goes down that will go up there as well if it's likely to be down for some time [...] but I think with new content we could be doing a bit more but there's also getting the angle right on Twitter because it's more chatty whereas on a webpage you can just say we bought this package blah blah blah and it's a bit boring but I think with Twitter you have to try and engage students a bit more you can't just say

we've bought this we've bought that we've got this we've got that you have to try and find some way of making it a bit more interesting and relevant to them tying it in with something else to get them to look at it

I you did mention that the new what's going on it's a new webpage you gonna
P it's been going for quite a while the what's new page it's under re- under electronic resources section in the library but I think it's just a quite boring flat page there's no pictures on it there's nothing really exciting about it it's just telling you we've got this this is what it is this is how you access it so perhaps when we get the new website we can look at making it a bit [more]

I [may be
it will be the CA interface for [example]

P [() yeah] it could be looked at making it a bit more interesting so if you have any ideas [()]

I [because] you did mention that it's a (bit heading) one that what for example when I go through the website if I want to look at the content awareness services especially the PDF that you did send it to me before that giving me how to set alert services in different databases so I did find that I have to go through many links before I come to the actual service for example [.] and another thing I found that there is imbalance between providing the services and I think you mentioned that between school=

P =that's right=

I =yeah so for example we have the science and engineering they have support research and they have guides in their webpage the subject library webpage and both of them lead to other links which you can you know you can do the content awareness (updates) whereas humanities and business they take you to a page where it's open library open university and then through the open university you go to the keeping up-to-date services so I just want to know why it's this way could you explain it for me please

P subject librarians have the freedom to update their own pages and put up on the pages really anything they want to [.] we have a kind of general framework so we've decided the tabs that are definitely going to be there for example databases [.] books so there's the referencing ones so there's some

things that are definitely going to be on the pages but beyond that people can really have the freedom to do what they like really so it's not it's not controlled

I so everyone do like whatever they [want in their pages]

P [wh- whatever they] want to on their pages
yes =

I =ok=

P = and we can get the support staff to help upload the pages if necessary now [.] and again the pages are fairly new we got the service it's called lib guides I think it's about a year two years ago now t- probably coming up for two years so again we could do more on developing it than what we have at the moment

I and because you did mention maybe perhaps in the next stage you will improve it more (or) doing something [.] depending on what I mean you [gonna]

P [if if] we get feedback from users about what they want=

I =are you getting feedback from users

P occasionally people will say things like we can't find something or if we go on a training session someone will ask about something and you think oh that's a good idea [.] like someone asked once about great literature and I put that on the database list but we don't have a guide about great literature =

I =yeah=

P =people have asked more about endnotes so we're doing an endnotes page we have a referencing page but we're going to expand it out and have a page on endnote and endnote online (and) more guides up there so it's [.] it's finding a way of getting feedback from users usually people that feed back are either people that are very happy or people that are not happy but the middle people [tend not to to say] very much and deciding is it just one person that's saying=

?? [((laughter))]

P =we do a student survey every year but I don't think anything really has come out that's relevant this side of things you know the guides=

I =yeah=

P =it's more like oh we don't like the toilets or [((laughs))]

?? [((laughter))]=

P = or it's too noisy on level five or it's too (quiet) so it's deciding when you change is it because it's the majority of people would like this or it's just one person=

I =yeah=

P = a way to get more feedback would be good and we need to look at how to how to do that

I also I did found for example in the website that there is a lots more about supporting the the search terms in the library website so you have the SuPrimo there is a lots of guide and support on how to use it why do you need to use it if you need a support or a help you can go back and there is lots of things giving you more details about where to go and who to ask then it showing you for example the different categories that SuPrimo can provide like the book and the e-book and there's the e-journals and all that stuff [...] but if we are talking about the content awareness because I did mention that the different types so it's involve the searching browsing monitoring and chaining [...] in terms for example the the other types there is no much about it in the website and for example the monitoring all what I found is more about facilitating the email alerts and the RSS whereas you know you can do another type of services under () terms for example or browsing also I [...] you did mention that in the (list) on the databases for example you allow your users to create their own list of databases like a form you select the database =
P =they can select the ones that they want to [search (also)]

I [yes and then it will] keep you know updating them by you know the stuff that added to these databases=

P =they can set up an alert on a particular database and find out what's been added

I is there something similar to that in the content awareness can I create my own forms for example and

P do you mean=

I =in terms of the services I mean I put alert services I put RSS I keep monitoring some academic social media=

P = oh right (a) content awareness about content awareness in a way like what new content awareness services are out there=

- I =yeah=
- P =not something I'm aware of [...] there may be but it's not something I've come across it tends to be like individual databases or individual journals that have their own content awareness services or content awareness and the service called Zetoc that covers a number of journals
- I ok choosing these services like the Zetoc and the other type of services like the ProQuest for example why it's just these services for example why not others
- P these are big services so perhaps they have the technical know-how behind them to be able to offer this [...] again it's kind of like with the subject library (it's) up to individual service providers like ProQuest Zetoc Elsevier what they offer larger ones probably provide more because they've got more staff [...] they've been in that area working in that area for a longer time so they know they've got more of an idea of the market what people want [...] I think most of the bigger services do offer something it's when you get down to smaller databases smaller e-journals that don't that are not really set up they're not geared towards doing that [...] might be a professional society for example and they don't really have the kind of money and the manpower behind the service=
- I =I see=
- P =and maybe they don't have a market for it may be they just produce one journal so people know the journal to go to and maybe that's all they have to look at whereas if you look at something like ProQuest they've got [...] I think we take about twenty databases but there are even more than that so it's a huge number to actually keep on top of and find out what's been added to them
- I ok [...] now I'm gonna move to the next question is there any policy or a strategy for providing the content awareness services in the library
- P afraid to say we no we don't have a policy or strategy no
- I ok [...] so [...] ok do you think do you know why you don't have this policy for example
- P I think we've been () I think the university is very much independent and it's staff have been quite a lot of academic freedom to manage things the way

they'd like to be managed in their subject so it's not been very centralised in this university and I think the library perhaps operated the same way it was very much do what you want in your subject area [...] but we do have more policies and strategies because we're trying to be a bit more uniform in what we do so students for example get the same experience [...] so if they come to be a student in (Hass) they'll get the same induction as they would if they were a student in business because before it depended on what department you were in you know what level of contact you got with the library so I think it's maybe the same in this area it's maybe not been thought we need to have a policy it's maybe just not come up before [((laughs))] sometimes it comes=

I [ok (laughs)]

P =out in surveys you know students (or the staff) surveys and then you suddenly think oh no we don't have that and that is maybe an area we need to start looking at and it's not arisen in the past=

I =ok thank you that is lovely [...] are there any things you would like to improve the delivery of the KUTD services in the library

P well I would like to find out a bit more about what other libraries do and what they offer and if we're able to do something similar here but that's a lot of the way that libraries work we have a look round [((laughs)) see] what =

[((laughs))]

P = others are doing and our [...] (we won't call the) competitors maybe collaborators or colleagues ((laughs))=

?? =((laughter))=

P =at Glasgow or Edinburgh and see what they're doing in a particular area and then we think oh yes that's that looks good and sometimes we're ahead of the game and sometimes we're behind

I I think it's a good idea to compare=

P = to compare [...] we've certainly done that with the lib guides for example Newcastle are really ahead of the game and they have been for years and they've got so many guides in so many areas [...] but with that you can actually share what you've done as long as you acknowledge [...] so we've been able to ask them can we use your guide adapt it [...] yes that's fine as long as you acknowledge where it's adapted from [...] so it'd be useful to know what other

libraries are doing in this area

I ok [...] that is lovely how how does the library make research-active staff and PhD students aware of the content awareness in that the library provides

P I think our delivery and our promotion are sort of intertwined because things like the way we deliver it also makes people aware that it exists [...] the fact that you're contacting the library to (see) that we've got a new database or a new journal then that kind of makes them aware of new content [...] s it's kind of hard to separate the delivery from the promotion in a way [...] we have a group in the library that b- that I chair it's called the resources promotion group where we try to come up with ideas of how we promote our electronic content [...] and we've done a few things there for example it's more for students at the moment I suppose but we've done a short loan we've put stickers on our short loan books to let people know there's an electronic copy available so if they look at the print book they'll know that they can get an electronic book [...] we've put round posters we've e-book posters that we're putting up we've been running the drop in sessions and we've had the e-book one [...] but I don't think [...] I suppose (in a) way it's kind of chicken and egg we don't have that many content awareness services so we don't really need to promote them because we don't offer a lot at the moment but if maybe it did grow then again we'd have to think about how we'd [(how we'd do this)]

I [ok [...] so so you mean] that the user need to call the library in order to get you know any current awareness

P they they would [make] contact with us and see what they needed =

I [phone]

I =ok=

P =yep [...] in in a lot of ways I suppose with the advent of the internet the staff have been doing a lot for themselves now they have their own [...] groups or their own research networks [...] they use Twitter and Facebook so maybe we've assumed wrongly that people are doing it for themselves I think particularly research staff [...] and research students and we think if we're not hearing from them maybe they're quite happy doing that [...] but that might be a wrong assumption maybe they're not happy doing it [maybe they do need (

)]

I [so do you think we need] to measure their you know their awareness about the services

P I think it'd be useful to find out what staff know and what they do [.] and and research students as well

I to know their satisfactions about maybe the services=

P =that's it and what what would be useful to provide [.] in the future [.] I know we've had a survey that's gone out to staff but it's about the building space that they would like in the library [.] so would they like a small room if they're a research student to work in do they need individual desk space do they need [.] a group area to work in where they can have projection facilities so there's that sort of survey gone out [.] more about the actual facilities but not so much about the services

I ok [.] ok thank you=

P =so I think it would be useful to know

I So in terms of for example providing online and offline sessions about content awareness I think you are not=

P =no we're not no if someone contacted us and wanted something then it would likely be a one-to-one unless we saw that there was a market there to provide more [.] sometimes that has happened we find that people are struggling with something like with the referencing [.] that was (where we got) more and more enquiries from students from staff and from postgrads and that's why we're stating concentrating more on offering help with referencing so if maybe we found that we were getting more enquiries [.] our help desk does have a [.] a system that they use to monitor enquiries called (LANDesk) so they can actually go back and see what enquiries have come through and you know [.] what the peaks are [.] so is everyone asking about how to find a book or is everyone asking about content awareness services so [() they could]

I [() they raised] some questions=

P =they could [.] I don't know if there has been cause I don't see the [.] the stats for this but if management did they could actually look at the=

I =but service desk it's for the whole library=

P =it's for the whole library it's for the whole university in fact and it's both library and IT [...] so it's maybe hard to [actually filter down to]

I [yeah ok ()] ok that is lovely [...] now in terms of supporting the services again you did mention that you know about the feedback and the comments that you could get about the service it itself [...] so you mention that about for example the staff there is no much you are not hearing much about the services from them

P We haven't so far [...] either face to face or through the enquiry service or through any training sessions we've offered and anything else or any feedback that we've had any surveys that have happened we've not had [...] or [even email] cause staff sometimes email you about things or phone you =

I [()]

P = about things [...] that's not something that I've ever been asked about [...] I don't know if my colleagues have but when I sent this round no one came back and said you know that they'd had anyone

I () at the first place to set the services for example at the beginning or even that is not

P sorry I'm not clear

I I mean the services itself so like me I did come to you () to help me in setting the services

P (26:45) some people will ask about setting up alerts for example or how to do that or which databases to use for their area or how to keep up to date with content that's been added [...] it tends to be mainly PhD students like yourself that come and ask that and it's part of a a larger session so I would do a one-to-one with them and I'd take them through other things [...] so it wouldn't be a full session just on content awareness they'd be finding out about their particular database they'd be finding out about how to search how to get things from the British library all these different things as well

I I see ok [...] how highly a p- (priorities) of the content awareness services compared to services in the library

I [...] I presume the fact that we don't do much on it that [it's not [...] it's not] =

?? [(laughter)]

P = a top priority ((laughs)) cause I [...] I don't think we have (like) a service as

such [...] so it's not embedded in what we do it's more kind of ad hoc if someone asks for something then we'll react and we'll do it [...] but I do think it's important that staff and students are aware of what content we have what we provide I think we do [...] try to make [...] staff and students aware of what we have [...] but again I think it's been easier in the past for them to monitor new research for themselves because it'd be quite difficult with (our) number of staff the number of researchers the number of PhD students to target [...] specific [...] services for them because it might be that they already require something a bit different [...] and if it's quite generic [...] then it might not you know meet that person's needs it's a bit like searching you can tell people how to search and you can do a lot of (generalisation) but then if they're using a different database () that works slightly differently than that one you know you don't quite do that so [...] but again I would be interested to know [...] are is it sufficient for people to be doing it for themselves or do they need more help and what help do they need [...] what aspects do they need help with is it the setting up is it the monitoring [...] don't know

I yep I see [...] in terms of engaging the user with the services so do you train research-active staff and students in using the content awareness services or

P I think just as part of other things that we train on so it's part of a general session=

I =a general session yeah=

P =so if I'm partly because I don't get if I'm training I don't get a lot of time with students you maybe get an hour session sometimes you get two hours sometimes you get repeat sessions [...] it depends on the staff and on the timetable how tightly timetabled students are if it's top postgrads for example and how much the staff do themselves in the department some staff may be doing this for students [...] I know some used to teach referencing and (sibs) they would cover that area I know some taught referencing and (CIS) so it's possible staff could be doing it as well

I so it's depending on the needs of the you know the user it's not like the skill boots where you are sitting sessions in the library and keep repeating it from time to time=

P =no I mean if there was we could have a content awareness skills (boost)

session if that was required if we thought there was a demand for it [...] at the moment really what we do is we provide [...] a longer session on (sorry not) a longer session a more encompassing session on different areas and that may be part of it but it's not specific just about content awareness [...] and the other thing is just putting some guides available online [...] for people to set up alerts themselves but there could be other things that we could do

I yeah [...] and if they are struggling they would call you back or contact you=

P =they contact [(us) yeah]

I [and the numbers] of these people are very=

P = they're very small yeah [...] very small

I I see ok do you have any way to measure the success of the content awareness for example because we did mention for example if you're providing the training sessions or when you said boots skills for example how do you know that for example these sessions or these training sessions that you provide it's already succeed or it's effective

P (32.05) We used to do a I used to do evaluation forms and I looked after every session at the end of the year what people were asking for what they found out from it you know like [...] name two things that you got out of this session two things you'd like to change about this session [...] but I was finding that people were getting f- feedback I don't know feedbacked out kind of déjà vu with having to give too much feedback [...] they were getting it in the department and then I was asking them to do it after an hour's session and it was getting a bit too much so I now kind of pick and choose which sessions I want feedback on it's maybe something new that I'm trying and then I'll ask for feedback after that and hope that they'll be feeding back to their tutor with anything else [...] so I I don't know what the best way to do sometimes I've (had) post-its and I've asked people to put post-its up on the wall cause that's quite quick to write a post-it rather than write a full form or do something online [...] sessions that we use the booking session for [...] there is an evaluation form a generic evaluation form that people can fill in afterwards so we've got them to do that if it's a thing that goes through the booking system [...] I'm kind of needing guidance myself on what the best way to get follow up from people would be because (I) people will fill it in but you just wonder if they're just going like this

((makes motion of blindly ticking boxes)) [so they can (get ahead)] and go=

?? [(laughter)]

P =on to the next class you know () to get feedback that's actually useful

I yeah I think it's because you know we are talking about maybe the quality of services and we want to increase the usage of services in order to increase their engagement so we need maybe the library need maybe to [.] work on (maybe) about the quality understanding what is exactly the the personal needs of individuals or academics in order to you know to provide the services that match their needs and when you mention that if we could do (any) questionnaire to measure the satisfactions of maybe to understand if they're struggling with the services or they're doing fine or not (these) things is really important to look at

P () I think finding out more about what people want [.] it's best to do that because as I say sometimes they get surveyed out they get so many surveys now on so many different things and it's trying to engage them =

I =more and more=

P =uh hu [.] if it's something you're interested in then you'll fill it in and then you'll send it back if you think it's going to be useful but [.] people are just strapped for time they've got so many other things to do that they think (oh it's another thing [to do I'll leave that bit]) () (email) or whatever=

? [(laughs)]

I =yeah that's true [.] ok at the end I want to thank you you know for being here and I want to ask you if there's something you want to add for the previous things or the questions is there something you want to add or

P I I think really I'd like to find out a bit more about what about how social media can help with content awareness because I think we are behind in that area [.] we've used it kind of to inform people about what's happening what's coming up but not really used it so much to make people aware of what [.] how to keep up to date in their area and it I think it's something we're going to start looking at [.] I think we probably need to find out more ourselves before we start telling other people what to do

I and I think also like for example because you mentioned the the social media thing now [.] if we can for example combine or increase the level of

performance of using the services of the content awareness for example just not I'm setting email alert or doing the RSS no I'm combine that for example how to for example to connect my e- email alert with Google Scholar for example or combine the RSS and Research Gate or something like that so that maybe will help me engaging people more in social media [...] knowing peoples that they are quite professional in a particular field and maybe keep them up to date with the latest conferences or seminars in other universities or other departments and link that with the services that is already exist could help in =

P =yeah I'm sure academics must have ideas that they could pass on to other academics because I've come across people that've got Twitter groups set up and they can they can get things that way they can find out what's happening you know what conference is taking place in such and such and area but not all academics through the university or not all research students will know what the best way of doing things or different ways of doing things so I think maybe picking the brains of people that are already doing these things and b- being able to join it all together it's a bit like a jigsaw puzzle all the pieces are there but it's making the connections between them=

I =yeah that is right yeah [...] ok thank you so much for taking the time [to talk to me]

X [I have a] question () some things you were saying () you do a survey (every) year on the library services I mean roughly how many what kind of response rate do you get (I mean) I imagine it's small but=

P =it's quite s- I can't remember off hand but I know for science for example you're seeing something like twenty students (in) maths (there're) less and its mainly () it's an undergraduate survey really it's [...] so we still need to find out what research students and staff want so but this this is an annual one and it tends to be things like I don't like the toilets I can't connect to Wi-Fi

X but do you use [...] I know the library (logs) a lot of stuff on their website do you actually use any of the log data at all [...] I'm just thinking of the like you've got the kind of what's new page and so on do you how many people access that

P I I don't know if we've doing anything I don't know if senior management

are doing anything I'm trying to think how we've used it in the past [...] I know in the past we've looked at how people have been searching SuPrimo and what words they've been putting into SuPrimo I know when we've got the lib guides we can they're actually separate from the library website so we can see which ones are being used so we can see the top guide you know what's the most popular one [...] but I don't know if there's any use been made of the rest of the data that's [...] some things are set to (scono) for example you've got stuff that you have to read you know number of people coming into the library or books borrowed there are certain stats that are collected for that to give feedback to (scono) but I'm not sure with the website if there's any =

X = () =

P = yeah [...] cause there's Google Analytics we can actually look at how often pages have been used I think the last time we looked at that certainly the last time I looked at it was when we were changing the website and getting a bit of an idea how to redevelop it but it may be the senior managers are looking at it [every day (I don't know)] they might be on it all the time [((laughs))]

X [((laughs)) ()] [((laughs))] ok that's interesting I mean one of the things that Nouf was planning to do was actually to do a survey I know () but do a survey of research students looking at [...] how they keep up to date and what they do (I mean) is that [...] is that something the library would be interested in helping with

P I think that would be something useful to do [...] the person really that's been involved in the surveys is Emily she's the marketing person [...] Emily Lawty [...] but it tends to be she gets direction from (Dylis) who's our librarian about what to do what surveys we need to be conducting so she'd be able to tell you more about the results of the last survey you know and how it was organised and what feedback we got I've probably got a copy of the science part of it [...] I don't know if I've got the full thing but I've got the science bit of it and that that went out to the academic committees and I think the library reps possibly got a copy of that as well [...] but yeah I know (Dylis) did do a survey of [...] space and what research students wanted in terms of research space and how we could alter any space that we've got in the library [...] to satisfy their needs

but again it was more space [not actually resources]

X ()] what people actually do
and whether they feel that they're keeping up to date () of kind of
understanding what training people might benefit from

P It'd be really interesting to know what people do I'm sure some people out
there are doing amazing things and other people could benefit from what
they're doing but you just don't know unless you're working with them and
you're in their group you don't you pick it up=

X =and () [(laughs)]

P [(laughs)) I wish I'd known that when I started my PhD] not three
years down the line we get that we've heard that quite a lot didn't know that
existed or () oh really

X well that's handy ()

P yep [...] I mean certainly (Dylis) is always keen on engaging with staff and
students so if [] that's something you wanted to do then I'm sure she'd be [...]
unless there's another thing that's coming up [some huge project ()]
[(laughter) ()]

D yeah no [...] I mean there's a lot of guidance going on with social media and
libraries I know this because my students several of them chose to () an
assignment for class they had to write a paper on a current technology that
affects libraries and several of them did social media [...] I know this from my
own expertise as well as the papers they just wrote for me a few weeks ago [...]
there is a growing body of literature out there about best practices and
recommendations () and a student who's applying for a PhD (is) looking at
national libraries and how to develop policy for them to make the most out of
it [...] so I think if you're interested in learning more there's certainly a lot out
there that can help you

P We're thinking of having a skills boost session on social media but I think we
would have to update ourselves first before we actually=

D = I actually have a book called social media for academics that you have
available electronically and there's a it's a few years old now and there's a
chapter in there on that my colleague wrote on social media for academic
librarians specifically=

P =that would be () if you could send me the details of that=

D =sure=

P = cause we know that our training people (always do) they do a training course on social media for staff so maybe if as a starting point we went along to that and then kind of [.] went from there [.] but I but anything that you have would be helpful I think it is an area that (I was gonna say) behind in but that we are not as up to date as we could be (put it that way) ((laughs)) put a positive [spin on it ((laughs))]

Appendix 4: Summary of the Findings at the Librarian Interview

Services	Quotations re services	Library support of services	Quotations re support
Ways the library keeps users up to date	“Right I don’t know if you’d define it as a service as such but we do some things to keep people up to date about what’s happening in terms of new resources and new information that’s relevant to them”	Support not mentioned.	n/a
Lists of publications	“a number of the subject libraries send lists of publications in the area to staff then staff can select things that they want to order [.] so this might be electronic it might be emails that they send it could still be paper lists that they send as well most of the time it will be electronic lists they’re sending to people and then they can then choose publications from that and then we can order”	Info is filtered into subject areas for users and provides help.	“so rather than the staff having to find things and then order them we’re kind of directing them towards what might be relevant and it varies from subject to subject because some staff maybe in like computing and information studies you may be quite used to doing that yourself but maybe in other areas maybe humanity areas (when) there’s a lot of material to go through the librarian may be filtering it a bit before sending it out it makes it a bit easier for people to choose publications.”
Email new contents	“we also just email if we get new content into the library so if we get new books or new journals or new databases new e-book packages then we often email the library (reps) each of our departments has a representative----- who’s the kid of liaison point between the department and the library so a lot of the information is channelled through that one person and then they will then channel it on in whichever manner they feel appropriate”	New content is disseminated via different channels.	“some departments might have a staff newsletter that goes round some might use email lists some might have a Facebook or a blog or something like that but if we send the information to the reps they can then decide what they want to do with it after that”
New book reports	“we run a new books report every month and again some subject librarians send this out [.]----- again it’s on a subject by subject basis some subject areas may require that more so it’s just a report we get from the catalogue and then we can send out the new books that have appeared the last month although when we get our new library management system it’s likely to be able to do this so I think people will be able to do this for themselves find out new books that have been added and it’ll be easier that just having -----	No support provided as book reports have been discontinued.	“I’ve not found that my library reps particularly needed to have it so I tried it for a short amount of time but they didn’t really need to know and I think they were finding out themselves kind of what new books had been added”

<i>what's new</i> webpage,	“on the what's new page we put new electronic resources that are relevant . it's mainly databases it's some e-book packages occasionally journals although most of the journals tend to go out via other means you know to the library reps and this is updated fairly frequently whenever we get anything new we also put details of trials up there so if we're trialling a new e-book package or a new database we'll put it up -----	No support is currently provided. The library acknowledges the webpage is hard to find and intends to redevelop the website and increase awareness of the webpage via different channels.	“what other things have we got we've got a page on the website (but) I do think it's a bit hidden it's called what's new but I think trying to find it's probably the problem to start with although we are going to be redeveloping our website in line with the university brand so that is something that will be happening on that page as well as making people aware of it by email or word of mouth ”
Informal group	“ This is an informal group that meets now and again and in fact she was just meeting in that afternoon when I asked her what she did, and she just gets together with people in that faculty so it's just an informal people can come along chat find out what's happening in the library what's happening in terms of content and they can ask questions so it's a bit of a social get together and I suppose she finds a bit a bit about what's happening in the department as well so it's a two way so it's not a formal thing it's quite an informal group ”	Not mentioned	n/a
Meeting new staff	“at one point and we're given a list in the library of new staff in the market place so we can then target these staff in any way we choose, it's mainly to introduce them to the library it's just to give them a nice welcome message-----	Help provided on request	“ if they want to meet us and if they then decide ok I want to find out about research in my area or what can you tell me about new publications then we can set up a something with them so I suppose the onus is on the new member of staff to then contact us and say what they would like from that if anything”
Twitter and Facebook	“we do have Twitter and Facebook but I don't think we use it that much for content awareness and I think that's something we could do more of in future ”	No support of KUTD services is provided as social media is not used to promote them	“it's one person who looks after our Twitter feed and our Facebook page so everything has to go via that person so you have to kind of remember to do it it's not an automated thing so you'd have to remember oh we've got this new book we've got this new service I must remember to tell (Emily) to put it up on Twitter so we can't just go ahead and do it we've not got the facilities to do that centralised centralised (that

			<p>would be the message) Twitter feeds centralised Facebook page yes I think social media we could be doing more there in future</p> <p>How to use it? “but I think with new content we could be doing a bit more but there’s also getting the angle right on Twitter because it’s more chatty whereas on a webpage you can just say we bought this package blah blah blah and it’s a bit boring but I think with Twitter you have to try and engage students a bit more you can’t just say we’ve bought this we’ve bought that we’ve got this we’ve got that you have to try and find some way of making it a bit more interesting and relevant to them tying it in with something else to get them to look at it”</p> <p>Web page “it’s been going for quite a while the what’s new page it’s under re- under electronic resources section in the library but I think it’s just a quite boring flat page there’s no pictures on it there’s nothing really exciting about it it’s just telling you we’ve got this this is what it is this is how you access it so perhaps when we get the new website we can look at making it a bit”</p>
Set up preferences on electronic KUTD services	<p>“not something I’m aware of there may be but it’s not something I’ve come across it tends to be like individual databases or individual journals that have their own content awareness services or content awareness and the service called Zetoc that covers a number of journals”</p>	Not mentioned.	n/a
Zetoc and ProQuest	<p>“these are big services so perhaps they have the technical know-how behind them to be able to offer this [.] again it’s kind of like with the subject library (it’s) up to individual service providers like ProQuest Zetoc Elsevier what they offer larger ones probably provide more because they’ve got more staff [.] they’ve been in that area working in that area for</p>	Support is provided by the services but not by the library.	<p>“know they’ve got more of an idea of the market what people want [.] I think most of the bigger services do offer something it’s when you get down to smaller databases smaller e-journals that don’t that are not really set up they’re not geared towards doing that [.] might be a professional society</p>

	<p>a longer time so they”</p>	<p>Cover more</p>	<p>for example and they don’t really have the kind of money and the manpower behind the service”</p> <p>“maybe they don’t have a market for it may be they just produce one journal so people know the journal to go to and maybe that’s all they have to look at whereas if you look at something like ProQuest they’ve got. I think we take about twenty databases but there are even more than that so it’s a huge number to actually keep on top of and find out what’s been added to them”</p>
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Table 31: Summary of the Librarian Interview

Appendix 5: The Questionnaire



How Do Academics Keep Up to Date?: A Case Study at the University of Strathclyde

Firstly, thank you for taking part in this survey; I really appreciate it!

My name is Nouf Alshareef and I am a PhD student in the Department of Computer and Information Sciences at the University of Strathclyde, researching how staff and PhD students keep up to date with the latest developments in their fields. I'm really excited about this work as I think it will ultimately be useful for both academics and PhD students to help them understand different ways to keep up to date, design better training and deal with the enormous amount of information that is out there.

All information is provided in confidence and will be used for academic purpose only. Any identifying data will be anonymised before use. This study, including the data management, storage and deletion plans, has been approved by the Ethics Committee of the Department of Computer and Information Sciences. Anyone volunteering to take part in a follow-up interview or be considered for the gift voucher draw is required to provide their emails for contact purposes only.

The online questionnaire; it should take around 10 minutes to complete. Your participation is greatly appreciated and, please do not feel you need to answer every question should you prefer not to.

To show my appreciation, 4 participants will win a £20 Amazon gift voucher.

First Section:

Personal Details

Q1 What is your age group?

- 21-30
- 31-40
- 41-50
- 51-60
- >60 years

Q2 What is your gender?

- Female
- Male
- Other
- Prefer not to say

Q3 In which country did you obtain your most recent degree?

And there will be a drop down list by the countries name

Q4 For how many years have you worked or studied at the University of Strathclyde?

- Less than a year
- 1 year to less than 4 years
- 4 years to less than 6 years
- 6 years to less than 10 years
- 10 years or more

Q5 What is your main position?

- Professor
- Reader
- Senior Lecturer
- Lecturer
- Research fellow
- Research associate
- PhD student

Q6 To which faculty do you belong?

- Business
- Engineering
- Humanities and Social Science
- Science

Second Section

General Information about keeping up to date

Q7 How important do you feel it is to keep up to date with the latest developments in your field?

- Not important
- Less important
- Neither important nor unimportant
- Important
- Very important

Q8 For which work-related tasks do you feel it is most crucial to keep up to date? Please choose as many options as you feel appropriate.

- Researching
- Teaching
- Citizenship
- Knowledge exchange
- Administrative work
- Other, please specify-----

Q9 How difficult do you feel it is to keep up to date in your field?

- Very difficult
- Difficult
- Neither difficult nor easy
- Easy
- Very easy

Q10 Have you ever attended any training courses on keep-up-to-date services?

- Yes
- No
- Not sure

Q11 What type of training was it? Please choose as many options as you feel appropriate.

- Training on the university library's keep-up-to-date services
- Other online courses

Q12 How would you describe yourself in terms of your ability to use varied tools and methods to keep up to date with the latest developments in your field?

- Beginner
- Competent
- Expert

Q13 In order to keep up to date with the latest development in my field I regularly:

Group name	Different ways or tools	Nerve	Rarely	Sometimes	Often	Very often
Academic Tools (AT)	1-Use academic databases or bibliographies (such as Science Direct, Web of Science and EBSCO)					
	2- Use academic sharing websites (such as Research Gate or Academia)					
	3-Use professional associations (such as communication through newsletters and websites)					
Academic Journal (AJ)	4- Scan the online table of contents of journals in my field					
	5-Set up alert services for academic journals					
People and Event (PE)	6-Attend different events (such as conferences, seminars and workshops)					
	7-Scan lists of papers in conferences					
	8-Ask my colleagues					
Library Services (LS)	9-Ask the library staff					
	10-Visit the library or its website					
	11-Scan the library shelves					
Social Media (SM)	12-Post questions on social networks (such as Facebook or Twitter)					
	13-Use social media websites to follow certain academics or authors					
	14-Follow the latest research conducted by research groups					
	15-Follow the latest research conducted by significant independent researchers in my field					
Alert Services (AS)	16- Set up alert services to notify me of new papers					
	17-Use alert services and feeds for academic databases					
Citation Services (CS)	18-Use 'cited by' in Google Scholar to see who has cited papers					
	19-Use specialised applications to import all cited papers (such as Clowiz, RefWorks and Mendeley)					
	20-Follow references cited in an interesting paper					
	21-Follow authors who cited interesting papers					
Multimedia (MM)	22-Look at technical diagrams (such as charts, plans, schema and models)					
	23-Watch video clips (such as TED talks, itunesU, Geoset , EdX)					
	24-Listen to audio clips (such as academic podcasts, lectures, radio)					
Other Sources (OS)	25-Use search engine websites (such as Google, Google Scholar, Yahoo and Bing)					
	26-Scan Amazon for new books					

Q14 Are there any other ways in which you keep up to date with the latest developments in your field?

Q15 Which of the following obstacles can affect your ability to keep up to date? Please choose as many as you feel appropriate

- Lack of awareness about how to use keep-up-to-date services.
- Lack of time to keep up to date
- There are no obstacles which affect my ability to keep up to date
- Other, please specify -----

Third Section

The University library provides services to help you keep up to date. The following questions are about your awareness of these services in order to help us improve them.

Q 16 Are you aware of the services provided by the university library to help you to keep up to date?

- Yes
- No
- Not sure

Q17 Have you ever sought the help of a librarian to keep up to date?

- Yes
- No
- Not sure

Q18 Would you like help in using keep-up-to-date services provided by the library?

- Yes
- No
- Not sure

Q19 Have you ever used the library's keep-up-to-date services?

- Yes
- No
- Not sure

Q20 How helpful do you find the following keep-up-to-date services offered by the University of Strathclyde library?

No	Services	Very Unhelpful	Not helpful	Neither helpful nor unhelpful	Helpful	Very helpful	Not used
1	Setting up alert services						
2	Sending you list of publications in your field						
3	Emailing you with new content in your field						
4	Telling to you about your information needs						

Q21 To what extent do you agree or disagree with the following statements?

Statements	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Not used
I can easily find and access links related to keep-up-to-date services on Strathclyde University's library website.						
I can easily set up keep-up-to-date services via the library website.						
I can get help and support about keep-up-to-date services from the service desk when I need it.						
It is easy to communicate with the library about keep-up-to-date services.						
The response of the library service desk to enquiries about keeping up to date is fast and reliable.						
I can find support from the library when I need it about keep-up-to-date services.						

Q22 Of these options, which do you think would improve your ability to keep up to date?

Please choose as many options as you feel appropriate.

- Training session on tools services for keep up to date
- Tailored support from a librarian with expertise in keep-up-to-date services
- Support to use specific keep-up-to-date services such as alert services
- None of the above

Q23 Would you attend a training session to learn how to use keep-up-to-date services?

- Yes
- No
- Not sure

Q24 Is there anything else about keep up to date services that you would like to add?

Q25 Would you like to take part in a follow-up interview with me about keeping up to date in your field?

Everyone who takes part in the interview is eligible for entry into a prize draw to win a £10 Amazon gift voucher. Winners will receive the voucher via email.

- Yes, please provide your contact details

E-Mail Address:

- No

If you would like to be entered into a draw to receive an Amazon voucher as a thank you for taking part in this questionnaire, please provide your email address. Winners will receive the voucher via email.

E-Mail Address -----

Thank you for taking part, it is much appreciated!

Appendix 6: Friendly Email to Invite Participants to take part in the Research Questionnaire

How Do Academics Keep Up to Date?

Firstly, thank you for taking part in this survey; I really appreciate it!

My name is Nouf Alshareef and I am a PhD student in the Department of Computer and Information Sciences at the University of Strathclyde, researching how academics and PhD students keep up to date with the latest developments in their fields. I'm really excited about this work as I think it will ultimately be useful for both academics and PhD students to help them understand different ways to keep up to date, design better training and deal with the enormous amount of information that is out there.

The online questionnaire; it should take around 10 minutes to complete. Your participation is greatly appreciated and, please do not feel you need to answer every question should you prefer not to.

To show my appreciation, 4 participants will win a £20 Amazon gift voucher.

Dear,

My name is Nouf Alshareef and I am a PhD student at Strathclyde University, researching how academics and PhD students keep up to date with the latest developments in their fields. I would be really grateful for a few minutes of your valuable time to complete my online questionnaire survey which you will find via the link below. The main goal of the questionnaire is simply to develop a better understanding of how academics at Strathclyde University keep up to date with the latest developments in their field in order to develop framework for keeping up to date. Your answers are extremely important for my research, and I would really appreciate it if you could complete the questionnaire within one month of receiving this email.

The questionnaire should take no more than 10 minutes to complete. Your cooperation is much appreciated. It will be go live on the 13th of October and will be available until the end of November 2016.

To complete the questionnaire, please click on the following link.

https://strathsci.qualtrics.com/SE/?SID=SV_abNi87clGGGrHhz

Should you have any questions please email me at:

nouf.alshareef@strath.ac.uk.

Many thanks,

Nouf

Appendix 7: Questionnaire Information Sheet

My name is Nouf Alshareef and I am a PhD student at Strathclyde University, researching how academics and PhD students keep up to date with the latest developments in their fields. I'm really excited about this work as I think it will ultimately be useful for both academics and PhD students, to help them both understand different ways to keep up to date and obtain better training that enables them to deal with the enormous amount of information that is out there.

Research title

How Do Academics Keep Up to Date?

I would like to invite you to take part in research since academics are a key element in the research, which aims to develop a framework for keeping them up to date. I would like to provide a brief summary of the research to explain the rationale behind it and what it involves. So, please take your time to read this through before you decide whether or not to take part in the research.

Please feel free to ask should you have questions, want more information or find something to be unclear.

What is the purpose of the research?

The purpose of the research is developing a better understanding of how academics to keep up to date with the latest developments in their fields. By seeking to understand how academics stay up to date, the research will identify different obstacles and elements that affect keep-up-to-date behaviour, with a view to creating a framework that overcomes them. The framework will also identify varied tools, services and strategies which academics can use in order to keep up to date.

Who will be involved?

The research is a case study of Strathclyde University and it will focus on academic staffs and PhD student from different disciplines across the University of Strathclyde. Quantitative data will come from online questionnaires, and, for those who volunteer to provide further information, qualitative data will come from interviews.

Do I have to take part?

Participants are free from any obligation to take part in the online questionnaire or the interview. All participants who decide to take part in the research need to read the

information sheet and sign a consent form interview to show their agreement. Participants are free to withdraw at any time.

If you take part in the research, what will happen?

QUESTIONNAIRE	Frequency	Method	Duration	What will participants do?	What will happen next?
	Once	Online survey	10 mins	<ol style="list-style-type: none"> 1- Receive an email invitation to take part in the questionnaire. 2- If you agree to take part click on the link 3- Fill in the questionnaire and submit it. 	The data confidentiality will be analysed and interpreted.
INTERVIEW	Frequency	Method	Duration	What will participants do?	What will happen next?
	One	face to face meeting	45- 60 mins	<ol style="list-style-type: none"> 1- Receive an interview invitation to take part in the interview. 2- If you agree, read the information sheet. 3- Read the consent form and sign it. 	The data confidentiality will be analysed and interpreted.

Will my participation in the research be kept confidential?

Yes, the data will be kept confidential:

- Participants will be identified by an ID number rather than by name.
- Data will be used for the purpose of the research only.
- Only authorised people will view the data, such as academic supervisors.
- Online applications and software used to store, generate or analyse data will be password protected, e.g. Qualtrics.
- A password-protected laptop, accessible only to me, will be used to store any other electronic data.
- All data will be disposed of a.s.a.p., being deleted or shredded.

What are the possible disadvantages and risks of taking part?

There are no vulnerable groups involved in the study therefore no special measures regarding ethical approval need be taken.

What if I do not want to carry on with the research?

Participants have the right to withdraw at any time from the data collection process and any data already collected will be destroyed immediately in this case.

How I will use the results of the research?

The research will be published in a subscription-only academic journal and will be available upon request on the university website for use in development and training programmes. The results will also be available to participants upon request via myself for a limited time. Participants will not be identified in any publications, reports or documents.

For further information

Please contact me on

Mobile # -----

E-mail: nouf.alshareef@strath.ac.uk

University of Strathclyde

Signature of the researcher: -----

Appendix 8: Different version of the Questionnaire Advert

First Attempt

Hello researchers!

Do you struggle to keep up to date with the latest developments in your field? I want to help improve services and training for academics and PhD students at Strathclyde University to help keep you up to date in your field, but first I need your help.

By taking part in this survey, your answers will shed light on how people deal with the enormous amount of information out there. It's quick to complete at around 10 minutes, and all your answers are massively appreciated! You can find it online from 1st until the end of November, at: https://strathsci.qualtrics.com/SE/?SID=SV_abNi87cIGGGrHhz

If you've got any questions please email me at: nouf.alshareef@strath.ac.uk.

Thank you so much for reading.

The Second Attempt

CALLING ALL RESEARCHERS!

Do you struggle to keep up to date with the latest developments in your field? An RDP-supported project is currently underway to help improve services and training for academics and PhD students at Strathclyde University to help keep you up to date in your field – and we need your help!

By taking part in this survey, your answers will shed light on how people deal with the enormous amount of information out there. It's quick to complete at around 10 minutes and can be completed online <https://strathsci.qualtrics.com/SE/?SID=SV_abNi87clGGGrHhz> at a time that suits you during the month of November. Please refer any questions you have about the project to nouf.alshareef@strath.ac.uk.

The Final one on the Newsletter



Want to be in with a chance of winning £20 amazon vouchers (remember Christmas is around the corner)!?

An RDP - supported project is currently underway to help improve services and training for academics and PhD students at the University of Strathclyde; in a bid to help keep you up to date in your field. However, your help is needed!

By filling in a short (10 minute) survey, you will help shed light on how people deal with enormous amounts of information and data; a key component to helping this project succeed.

Want to help?

[Click here for link to the survey](#)

Questions about the project?

Email nouf.alshareef@strath.ac.uk

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POSTGRADS...**

Appendix 9: Questionnaire Pilot Study



How Do Academics Keep Up to Date?

Firstly, thank you for taking part in this survey: I really appreciate it!

My name is Nouf Alshareef and I am a PhD student in the Department of Computer and Information Sciences at the University of Strathclyde, researching how staff and PhD students keep up to date with the latest developments in their fields. I'm really excited about this work as I think it will ultimately be useful for both staff and PhD students to help them understand different ways to keep up to date, design better training and deal with the enormous amount of information that is out there.

I would appreciate it if you could fill in the online questionnaire; it should take around 10 minutes to complete. Your participation is greatly appreciated and, please do not feel you need to answer every question should you prefer not to.

In recognition of time that participants are taking to help me at this formative of my research process, I will enter all those who complete the questionnaire and /or offer feedback into a draw to win £10 Amazon voucher.

Please Note:

This questionnaire is currently in its pilot study stage. For this pilot exercise, it is designed to focus on all academics from any universities, including PhD students as well. This means you can interpret any questions asking about the University of Strathclyde as referring to your own institution.

While I am enormously grateful for your willingness to complete it, my research would benefit even more from any feedback you can offer on the questionnaire itself and how I might improve it. You are welcome to include any comments in the feedback box at the questionnaire. If you were able to indicate to which questions your feedback refers that would aid me in applying it to improving the document. Any feedback provided will remain confidential.

Thank you for your time

First Section: Personal details

Q1 What is your age group?

- 21-30
- 31-40
- 41-50
- 51-60
- >60 years

Q2 What is your gender?

- Female
- Male
- Other
- Prefer not to say

Q3 which country are you from?

(There will be a drop-down list of countries)

Q4 For how many years have you worked or studied at the University of Strathclyde?

- 0-1
- 2-3
- 4-5
- 6-10
- Over 10

Q5 What is your job title?

- Professor
- Reader
- Senior Lecturer
- Lecturer
- Research fellow
- Research associate
- PhD student

Q6 To which faculty do you belong?

- Business
- Engineering
- Humanities and Social Science
- Science

Second Section: General information about keeping up to date

Q7 How important do you feel it is to keep up to date with the latest developments in your field?

- Not important
- Less important
- Neither important nor unimportant
- Important
- Very important

Q8 For which work-related tasks do you feel it is crucial to keep up to date? Please choose as many options as you feel appropriate.

- Teaching
- Researching
- Citizenship
- Knowledge exchange
- Administrative work
- Other (please specify)

Q9 How difficult do you feel it is to keep up to date in your field?

- Very difficult
- Difficult
- Neither difficult nor easy
- Easy
- Very easy

Q10 Have you ever attended any training courses on keep-up-to-date services?

- Yes
- No

Q11 What type of training was it? Please choose as many options as you feel appropriate.

- Training on the university library's keep-up-to-date services
- Other online courses

Q12 How would you describe yourself in terms of your ability to use a variety of tools and methods to keep up to date with the latest developments in your field?

- Beginner
- Competent
- Expert

Q13 In order to keep up to date with the latest development in my field I regularly:

Group name	Different ways or tools	Yes	Not sure	No
Academic Tools (AT)	1-Use academic databases or bibliographies (such as Science Direct, Web of Science and EBSCO)			
	2- Use academic sharing websites (such as Research Gate or Academia)			
	3-Use professional associations (such as communication through newsletters and websites)			
Academic Journal (AJ)	4-Use alert services and feeds for academic journals or database websites			
	5-Scan the online table of contents of journals in my field			
People and Event (PE)	6-Attend different events (such as conferences, seminars and workshops)			
	7-Scan lists of papers in conferences			
	8-Ask my colleagues			
Library Services (LS)	9-Ask the library staff			
	10-Visit the library or its website			
	11-Scan the library shelves			
Social Media (SM)	12-Post questions on social networks (such as Facebook or Twitter)			
	13-Use social media websites to follow certain academics or authors			
	14-Follow the latest research conducted by research groups			
	15-Follow the latest research conducted by significant independent researchers in my field			
Alert Services (AS)	16-Use alert services and feeds for academic database websites			
	17-Set up alert services to notify me of new papers			
Citation Services (CS)	18-Use 'cited by' in Google Scholar to see who has cited papers			
	19-Use specialised applications to import all cited papers (such as Clowiz, RefWorks and Mendeley)			
	20-Follow references cited in an interesting paper			
	21-Follow authors who cited interesting papers			
	22-Look at technical diagrams (such as charts, plans, schema and models)			
Multimedia (MM)	23-Watch video clips (such as TED talks, itunesU, Geoset , EdX)			
	24-Listen to audio clips (such as academic podcasts, lectures, radio)			
Other Sources (OS)	25-Use search engine websites (such as Google, Google Scholar, Yahoo and Bing)			
	26-Scan Amazon for new books			

Q14 Are there any other ways in which you keep up to date with the latest developments in your field?

Q15 Which of the following obstacles can affect your ability to keep up to date? Please choose as many as you feel appropriate.

- Lack of awareness about how to use keep-up-to-date services
- Lack of time to keep up to date
- There are no obstacles which affect my ability to keep up to date
- Other (please specify)

Fourth Section

The University library provides services to help you keep up to date. This section asks about your awareness of these services in order to help us develop them

Q16 Are you aware of the services provided by the university library to help you keep up to date?

- Yes
- No
- Not sure

Q17 Have you ever sought the help of a librarian to keep up to date?

- Yes
- No
- Not sure

Q18 Would you like help in using keep-up-to-date services provided by the library?

- Yes
- No
- Not sure

Q19 Have you ever used the library's keep-up-to-date services?

- Yes
- No
- Not sure

Q20 How helpful do you find the following keep-up-to-date services offered by the University of Strathclyde library?

Services	Very Unhelpful	Not very helpful	Neither helpful nor unhelpful	Helpful	Very helpful	Not used
Setting up alert services						
Sending you lists of publications in your field						
Emailing you with new content in your field						
Talking to you about your information needs						

Q21 To what extent do you agree or disagree with the following statements?

Statements	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Not used
I can easily find and access links related to keep-up-to-date services on Strathclyde University's library website.						
I can easily set up keep-up-to-date services via the library website.						
I can get help and support about keep-up-to-date services from the service desk when I need it.						
It is easy to communicate with the library about keep-up-to-date services.						
The response of the library service desk to enquiries about keeping up to date is fast and reliable.						
I can find support from the library when I need it about keep-up-to-date services.						

Q22 Of these options, which do you think would improve your ability to keep up to date? Please choose as many options as you feel appropriate.

- Training session on tools services for keep up to date
- Tailored support from a librarian with expertise in keep-up-to-date services
- Support to use specific keep-up-to-date services such as alert services
- None of the above

Q23 Would you attend a training session to learn how to use keep-up-to-date services?

- Yes
- No
- Not sure

Q24 Is there anything else about keep up to date services that you would like to add?

Q25 Would you like to take part in a follow-up interview with me about keeping up to date in your field?

•Yes, please provide your contact details

E-Mail Address:

•No

If you would like to be entered into a draw to receive an Amazon voucher as a thank you for taking part in this questionnaire, please provide your email address. If you win, a voucher will be emailed directly to you after the draw.

E-Mail Address -----

Feedback on the questionnaire

Thank you for taking part, it is much appreciated!

Appendix 10: Pilot Study Comments and Feedback

Pilot study makes sure that the questionnaire is working well in terms of all technicalities whether it be related to the selecting the options or logical skip between the questions. As the main aim of pilot study was to collect feedback and comments, hence it was designed in such a way that an introductory paragraph was provided to let the participants know that the questionnaire is in its piloting stage and their comments would be very helpful in finalizing the design of the questionnaire. At the end of the study, a box was provided where the participants can note their comments, feedback or suggestions to improve the questionnaire. For example, in question number 3 was about which country are you from, I got the following suggestion:

'P5 Secondly, the question 'which country are you from' could be interpreted in multiple ways. I answered 'South Africa' because that is where I was born, but I have lived virtually all my life in the UK and have British nationality, so wasn't sure what to answer. It might be clearer if you ask about nationality.'

Moving on to the second suggestion which was about question number 4 that was related to the number of year working or studying in the university:

'P6 When you ask how long on the position, it's 0-1, 2-3... I'm 1.5. You gave me a hard time deciding which option to choose.'

Next, a couple of comments were received on question number 13 which included a list of different methods and 3 options for answers which are yes, not sure and no, most of the comments suggested to change the 'yes/no' options to five-points scale to reflect the frequency of usage such as:

'P1 The utilization questions which use the yes/don't know/no options are too limiting in options. I would suggest converting this to a five-point scale wording questions like "How often do you use ..." with Never/Sometimes/Regularly/Often/Always options. This will increase the fidelity of your responses, enabling a better analysis to be performed.'

'P2 In the question "in order to keep up etc", you have three columns "yes, not sure, no".. I think putting frequency is better. Because there are things I have done but like rarely, I don't feel ok putting "yes".. Plus as you answer, you tend to think the middle column is like 'a bit'. So I'd go "often, sometimes, never" or whatever degrees of frequency.'

'P3 The list of ways to keep up-to-date might be better constructed as often, frequently, rarely, not at all, not sure.'

'P4 Instead of yes/no/"not sure" for the question list about which keep up to date services I've used before, I would sometimes have benefited from an "unknown" / "not heard of it" option to tick! Anything I'd not heard of I just ticked "No", but there are things I've heard of but don't use ("No") and things I've not heard of before (also "No" in this version of the questionnaire). Might help you get some more info about how/where to advertise or circulate these resources if you got a sense what people have heard of and what they've not.'

'P5 Finally, the table that asks respondents to report which services they use might be made more informative by giving choices such as 'Yes, often; yes, sometimes; rarely; never' rather than 'yes; maybe; no'.'

Another important technical comment that grab the research's attention was to check the feasibility of filling the questionnaire from different devices i.e., laptop, tablet, PC or mobile phone so that all the questions are functioning properly from whichever device the participants prefer to fill the questionnaire.

'P7 The question on improving ability to keep up to date didn't let me choose multiple options (on mobile).'

Last but not the least, some important insights were received on the general thought of the topic such as; to provide a clear KUTD definition along with asking the time a participant spend on KUTD

'P9 Keeping up to date also means reviewing what I have already read some times - it would be interesting if there was any way to re-recommend an already read paper for review - if for example it suddenly became popular after a gap in citations.'

'P8 Logically laid out and comprehensive. I suspect that interpretation of the results would be more meaningful if you got a more specific indication of their field. Particularly true if the field is LIS (as mine is) but there have also been indications of substantial differences related to how much and how fast a field is growing. You might also ask how much time people spend keeping up to date, which is an indicator of importance, and whether that time has changed in the last few years. Very old data suggested that people don't change the time they spend (either up or down) as more sources become available, keeping up becomes easier.'

Although, the comments'P9 and P8' are very valuable, however, they couldn't be incorporated into the final questionnaire because firstly, with regards to the definition, the researcher wanted to let the participants build their own thoughts on KUTD and to keep it general without restricting them with some specific definition so that they can ponder over the KUTD concept throughout filling the questionnaire. Secondly, the comment related to the time spending on KUTD couldn't be added because it was realized that it is not quantifiable. Overall, most of these comments have been considered in the questionnaire design.

Appendix 11: Reliability Tests

Case processing summary			
		N	%
Cases	Valid	14	93.3
	Excluded ^a	1	6.7
	Total	15	100.0

Reliability Statistics	
Cronbach's alpha	N of Items
.920	25

a. Listwise deletion based on all variables in the procedure.

Table 32: Reliability (Pilot)

Reliability statistics

Cronbach's alpha	Cronbach's alpha based on standardized items	N of Items
.829	.833	26

Table 33: Reliability Results

Appendix 12: Research Population

The Academic Population	
Male	554
Female	274
Total	828

Table 34: Gender Distribution

The Academic Population	Engineering	Sciences	HASS	Total M&F
Male	252	216	86	554
Female	76	111	87	274
Total in each school	328	327	173	828
Responses in the sample	106	42	59	207
Response rate	32%	12.8%	34%	25%

Table 35: Academic Distribution

The Position Population	Engineering	Sciences	HASS	Total M&F
Professor	88	94	52	234
Reader	21	26	13	60
Senior Lecturer	58	62	47	167
Lecturer	63	56	55	174
Research fellow	19	24	12	55
Research associate	167	159	46	372
PhD student	943	700	231	1874
Total in each school	1359	1121	456	2936
Total responses in the sample	106	59	42	207
Response rate	7.7%	5.2%	9.2%	7%

Table 36: The Position Distribution

The Professor population	Engineering	Sciences	HASS	Total M&F
Male	79	82	38	199
Female	9	12	14	35
Total in each school	88	94	52	234
Responses in the sample	2	3	9	14
Response rate	2.2%	3.1%	17%	5.9

Table 37: Professor Distribution

The Reader Population (AK10)	Engineering	Sciences	HASS	Total M&F
Male	20	22	7	49
Female	1	4	6	11
Total in each school	21	26	13	60
Responses in the sample	0	1	7	8
Response rate	0	3.8%	53%	13%

Table 38: The Reader Distribution

The Senior Lecturer Population (AK09)	Engineering	Sciences	HASS	Total M&F
Male	42	46	24	112
Female	16	16	23	55
Total in each school	58	62	47	167
Responses in the sample	3	6	4	13
Response rate	5.1%	9.6%	8.5%	7.7%

Table 39: The Senior Lecturer Distribution

The Lecturer Population (AK07+AK08)	Engineering	Sciences	HASS	Total M&F
Male	45	18	37	100
Female	18	38	18	74
Total in each school	63	56	55	174
Responses in the sample	9	6	11	26
Response rate	14.2%	10.7%	20%	14.9%

Table 40: Lecturer Distribution

The Research Fellow Population (RS08+RS09+RS10)	Engineering	Sciences	HASS	Total M&F
Male	16	17	3	36
Female	3	7	9	19
Total in each school	19	24	12	55
Responses in the sample	1	1	2	4
Response rate	5.2%	4.1%	16.6%	7.2%

Table 41: Research Fellow Distribution

The Research Associate Population (RS06+RS07)	Engineering	Sciences	HASS	Total M&F
Male	129	113	15	257
Female	38	46	31	115
Total in each school	167	159	46	372
Responses in the sample	28	13	4	45
Response rate	16.7%	8.1%	8.6%	12%

Table 42: Research Associate Distribution

The PhD Students Population	Engineering	Sciences	HASS	Total M&F
Male	706	403	90	1199
Female	237	297	141	675
Total in each school	943	700	231	1874
Responses in the sample	63	29	4	96
Response rate	6.6%	4.1%	1.7%	5.1%

Table 43: PhD Distribution

Response	Frequency	Percentage %
Less important	1	0.50%
Neither important nor unimportant	1	0.50%
Important	63	30.4%
Very important	141	68.1%
Total	206	99%

Table 44: Important of KUTD (N=207)

Tasks related to KUTD	Frequency	Percentage%	Frequency	Percentage %	Total %
	Yes		No		
Research	197	95.0%	10	5.0%	100%
Teaching	103	50%	104	50%	100%
Citizenship	39	19%	168	81%	100%
Knowledge exchange	133	64%	74	36%	100%
Administrative work	31	15%	176	85%	100%

Table 45: Reasons for KUTD (N=207)

Difficulty in KUTD	Frequency	Percentage %
Very difficult	9	4.3%
Difficult	70	33.8%
Neither difficult nor easy	90	43.5%
Easy	34	16.4%
Very easy	3	1.4%
Total	206	99%

Table 46: Difficulties (N=207)

Attending training courses in KUTD	Yes	
	30	14.5%
	No	
	155	74.9%
	Not sure	
	21	10.1%
Total		
206	99%	

Table 47: Training Attendance (N=207)

Type of course	Frequency	Percentage%
Training on the university library's keep-up-to-date services	Yes	
	18	8.7%
	No	
	186	89.9%
	Total	
	204	98.6%
Other online courses	Yes	
	29	14%
	No	
	175	84.5%
	Total	
	204	98.5%

Table 48: Type of Course (N=207)

Ability to KUTD	Frequency	Percentage%
Beginner	43	20.8%
Competent	124	59.9%
Expert	23	11.1%
Total	190	91.8%

Table 49: KUTD Ability (N=207)

Methods	Never	Rarely	Sometimes	Often	Very often
Academic tools					
Use databases or bibliographies	16 (7.70)	23 (11.1)	40 (19.3)	60 (29.0)	52 (25.1)
Use academic sharing websites	19 (9.20)	28 (13.5)	71 (34.3)	53 (25.6)	20 (9.70)
Use professional associations	21 (10.1)	27 (13.0)	69 (33.3)	56 (27.1)	17 (8.20)
Academic journals					
Scan online table of contents of journals in my field	14 (6.80)	23 (11.1)	63 (30.4)	54 (26.1)	36 (17.4)
Set up alert services	62 (30.0)	34 (16.4)	33 (15.9)	37 (17.9)	24 (11.6)
People and events					
Attend different events	4.0 (1.90)	22 (10.6)	74 (35.7)	71 (34.3)	20 (9.70)
Scan list of papers in conferences	14 (6.80)	37 (17.9)	72 (34.8)	51 (24.6)	16 (7.70)
Ask my colleagues	9.0 (4.30)	25 (12.1)	84 (40.6)	57 (27.5)	15 (7.20)
Library services					
Ask the library staff	122 (58.9)	40 (19.3)	20 (9.70)	5.0 (2.40)	1.0 (0.50)
Visit the library or its website	54 (26.1)	48 (23.2)	48 (23.2)	32 (15.5)	9.0 (4.30)
Scan the library shelves	92 (44.4)	49 (23.7)	41 (19.8)	8.0 (3.90)	1.0 (0.50)
Social media					
Post questions on social networks (such as Facebook or Twitter)	112 (54.1)	37 (17.9)	23 (11.1)	11 (5.30)	7 (3.40)
Use social media websites to follow certain academics or authors	65 (31.4)	28 (13.5)	45 (21.7)	33 (15.9)	19 (9.20)
Follow the latest research conducted by research groups	40 (19.3)	34 (16.4)	66 (31.9)	35 (16.9)	14 (6.80)
Follow the latest research conducted by significant independent researchers in my field	39 (18.8)	36 (17.4)	53 (25.6)	47 (22.7)	15 (7.20)
Alert services					
Set up alert services to notify me of new papers	72 (34.8)	42 (20.3)	29 (14.0)	24 (11.6)	21 (10.1)
Set up alert services and feeds for academic databases	67 (32.4)	34 (16.4)	40 (19.3)	28 (13.5)	19 (9.20)
Citation services					
Use 'cited by' Google Scholar to see who has cited papers	34 (16.4)	26 (12.6)	50 (24.2)	41 (19.8)	39 (18.8)
Use specialised applications to import all cited papers	77 (37.2)	24 (11.6)	29 (14)	23 (11.1)	38 (18.4)
Follow references cited in an interesting paper	6.0 (2.9)	9.0 (4.3)	37 (17.9)	76 (36.7)	63 (30.4)
Follow authors who cited interesting papers	22 (10.6)	23 (11.1)	60 (29)	49 (23.7)	37 (17.9)
Multimedia					
Look at technical diagrams (such as charts, plans, schema and models)	45 (21.7)	42 (20.3)	41 (19.8)	41 (19.8)	18 (8.70)
Watch video clips (such as TED talks, itunesU, Geoset , EdX)	26 (12.6)	58 (28.0)	53 (25.6)	40 (19.3)	14 (6.80)
Listen to audio clips (such as academic podcasts, lectures, radio)	44 (21.3)	72 (34.8)	45 (21.7)	25 (12.1)	5 (2.40)
Other sources					
Use search engine websites (such as Google, Google Scholar, Yahoo and Bing)	1 (0.50)	9 (4.30)	25 (12.1)	63 (30.4)	93 (44.9)
Scan Amazon for new books	63 (30.4)	58 (28)	39 (18.8)	24 (11.6)	7 (3.40)

Table 50: Frequency of KUTD Methods Usage

Obstacles to KUTD	Frequency	Percentage %
Lack of awareness about how to use keep-up-to-date services	Yes	
	56	27.1%
	No	
	151	72.9%
	Total	
	207	100%
Lack of time to keep up to date	Yes	
	137	66.2%
	No	
	70	33.8%
	Total	
	207	100%
There are no obstacles which affect my ability to keep up to date	Yes	
	23	11.1%
	No	
	184	88.9%
	Total	
	207	100%

Table 51: Obstacles to KUTD (N=207)

Library services	Frequency	Percentage %
Awareness of the services	Yes	
	30	14.5%
	No	
	103	49.8%
	Not sure	
	57	27.5%
Total		
	190	91.8%
Ever sought the help of a librarian	Yes	
	21	10.1%
	No	
	87	42%
	Not sure	
	6	2.9%
Total		
	114	55.1%
Like help in using KUTD services	Yes	
	49	23.7%
	No	
	33	15.9%
	Not sure	
	32	15.5%
Total		
	114	55.1%
Ever used the library's keep-up-to-date	Yes	
	9	4.35%
	No	
	90	43.5%
	Not sure	
	15	7.25%
Total		
	114	55%
Set up keep-up-to-date services via the library website	68	32.9%
List if publications in your field	68	32.9%
New content	68	32.9%
Information need	68	32.9%
Access links related to KUTD	67	32.4%
Set up KUTD services via library website	67	32.4%
Help and support about KUTD services	67	32.4%
Communicate with the library about KUTD services	67	32.4%
Library services desk	67	32.4%

Table 52: Library KUTD Services (N=207)

Service	Very unhelpful	Not helpful	Neither helpful nor unhelpful	Helpful	Very helpful	Not used
Set up keep-up-to-date services via the library website	0.5%	1.4%	3.9%	4.8%	1.9%	20.3%
List if publication in your field	0.5%	1.4%	2.4%	5.3%	2.9%	20.3%
New content	1.0%	1.9%	1.9%	5.3%	2.9%	19.8%
Information need	1.0%	1.0%	3.4%	4.8%	3.4%	19.3%

Table 53: Helpfulness of KUTD Services (N=207)

Service	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Not used
Access links related to KUTD	1.0%	3.4%	2.9%	6.8%	1.9%	16.4%
Set up KUTD services via library website	0.0	2.9%	4.8%	4.3%	1.0%	19.3%
Help and support about KUTD services	0.0	1.4%	3.4%	5.8%	1.0%	20.8%
Communicate with the library about KUTD services	0.0	2.4%	2.9%	4.3%	1.4%	65.7%
Library services desk	0.0	0.5%	4.3%	3.4%	1.9%	22.2%
Can find support from the library	1.0%	1.0%	2.4%	4.8%	2.4%	20.8%

Table 54: Statements about KUTD Services (N=207)

Improving ability to KUTD	Frequency	Percentage %
Training sessions on KUTD tools and services	Yes	
	88	42.5%
	No	
	119	57.5%
	Total	
	207	100%
Tailored support from a librarian with expertise in KUTD	Yes	
	50	24.2%
	No	
	157	75.8%
	Total	
	207	100%
Support to use specific KUTD methods	Yes	
	85	41.1%
	No	
	122	58.9%
	Total	
	207	100%
None of the above	Yes	
	42	20.3%
	No	
	165	79.7%
	Total	
	207	100%
Would you attend a training session?	Yes	
	91	44%
	No	
	48	23.2%
	Not Sure	
	46	22.2%
Total		
	185	89.4%

Table 55: Options for Improving Ability to KUTD (N=207)

Appendix 13: Normality Test of the Questionnaire

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Age	0.255	207	0.000	0.796	207	0.000

a. Lilliefors Significance Correction

Table 56: Age Normality Test

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender	207	100.0%	0	0.0%	207	100.0%

Table 57: Gender Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Countries	0.446	207	0.000	0.526	207	0.000

a. Lilliefors Significance Correction

Table 58: Countries Normality Test

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Exper	207	100.0%	0	0.0%	207	100.0%

Table 59: Experience Normality Test

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Position	206	99.5%	1	0.5%	207	100.0%

Table 60: Position Normality Test

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Faculty	207	100.0%	0	0.0%	207	100.0%

Table 61: Faculty Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Importance	0.425	206	0.000	0.604	206	.000

a. Lilliefors Significance Correction

Table 62: Importance Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Research	0.541	207	0.000	0.219	207	0.000

a. Lilliefors Significance Correction

Table 63: Researching Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Teaching	0.342	207	0.000	0.636	207	0.000

a. Lilliefors Significance Correction

Table 64: Teaching Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Citizenship	0.496	207	.000	0.476	207	0.000

a. Lilliefors Significance Correction

Table 65: Citizenship Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Knowledge exchange	0.414	207	0.000	0.606	207	0.000

a. Lilliefors Significance Correction

Table 66: Knowledge Exchange Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Administrative work	0.513	207	.000	0.426	207	0.000

a. Lilliefors Significance Correction

Table 67: Administrative Work Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Difficulty	0.227	206	0.000	0.875	206	0.000

a. Lilliefors Significance Correction

Table 68: Difficulty Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Attended any training courses	0.389	206	0.000	0.672	206	0.000

a. Lilliefors Significance Correction

Table 69: Attended Courses Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Training on the university library's keep-up-to-date services	0.534	204	0.000	0.318	204	0.000

a. Lilliefors Significance Correction

Table 70: Training on the University Library's Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Other online courses	0.516	204	0.000	0.415	204	0.000

a. Lilliefors Significance Correction

Table 71: Other Online Courses Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Ability	0.386	190	0.000	0.696	190	0.000

a. Lilliefors Significance Correction

Table 72: Ability Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
AT databases or bibliographies	0.222	191	0.000	0.876	191	0.000

a. Lilliefors Significance Correction

Table 73: Databases or Bibliographies Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
AT sharing websites	0.203	191	0.000	0.908	191	0.000

a. Lilliefors Significance Correction

Table 74: Sharing Websites Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
AT professional associations	0.208	190	0.000	0.903	190	0.000

a. Lilliefors Significance Correction

Table 75: Professional Associations Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
AJ online table of contents	0.175	190	0.000	0.902	190	0.000

a. Lilliefors Significance Correction

Table 76: Online Table of Contents Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
AJ alert services	0.197	190	0.000	0.862	190	0.000

a. Lilliefors Significance Correction

Table 77: Alert Services Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PE attend different events	0.215	191	0.000	0.889	191	0.000

a. Lilliefors Significance Correction

Table 78: Attend different Events Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PE lists of papers in conferences	0.195	190	0.000	0.912	190	0.000

a. Lilliefors Significance Correction

Table 79: Scan Lists of Papers in Conferences Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PE ask my colleagues	0.224	190	0.000	0.892	190	0.000

a. Lilliefors Significance Correction

Table 80: Ask my Colleagues Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
LS ask the library staff	0.386	188	0.000	0.672	188	0.000

a. Lilliefors Significance Correction

Table 81: Ask the Library Staff Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
LS visit the library or its website	0.179	191	0.000	0.886	191	0.000

a. Lilliefors Significance Correction

Table 82: Visit the Library or its Website Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
LS scan the library shelves	0.293	191	0.000	0.795	191	0.000

a. Lilliefors Significance Correction

Table 83: Scan the Library Shelves Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
SM post questions on social networks	0.343	190	0.000	0.713	190	0.000

a. Lilliefors Significance Correction

Table 84: Post Questions on Social Networks Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
SM follow certain academics or authors	0.211	190	0.000	0.864	190	0.000

a. Lilliefors Significance Correction

Table 85: Follow Certain Academics or Authors Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
SM follow the latest research conducted by research groups	0.197	189	0.000	0.902	189	0.000

a. Lilliefors Significance Correction

Table 86: Follow the Latest Research Conducted by Research Groups Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
SM follow the latest research conducted by significant independent researchers in my field	0.168	190	0.000	0.902	190	0.000

a. Lilliefors Significance Correction

Table 87: Follow the Latest Research Conducted by Significant Independent Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
AS set up alert services to notify me of new papers	0.219	188	0.000	0.835	188	0.000

a. Lilliefors Significance Correction

Table 88: Set up Alert Services to notify me of New Papers Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
AS feeds for academic journals or databases	0.213	188	0.000	0.857	188	0.000

a. Lilliefors Significance Correction

Table 89: Feeds for Academic Journals or Databases Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
CS cse 'cited by' in Google Scholar	0.158	190	0.000	0.892	190	0.000

a. Lilliefors Significance Correction

Table 90: Cited by' in Google Scholar Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
CS use specialised applications to import all cited papers	0.245	191	0.000	0.813	191	0.000

a. Lilliefors Significance Correction

Table 91: Use Specialised Applications to Import all Cited Papers Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
CS follow references cited in an interesting paper	0.249	191	0.000	0.837	191	0.000

a. Lilliefors Significance Correction

Table 92: Follow References Cited in an Interesting Paper Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
CS follow authors who cited interesting papers	0.171	191	0.000	0.900	191	0.000

a. Lilliefors Significance Correction

Table 93: Follow Authors who Cited Interesting Papers Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
MM look at technical diagrams	0.170	187	0.000	0.894	187	0.000

a. Lilliefors Significance Correction

Table 94: Look at Technical Diagrams Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
MM watch video clips	0.192	191	0.000	0.912	191	0.000

a. Lilliefors Significance Correction

Table 95: Watch Video Clips Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
MM listen to audio clips	0.236	191	0.000	0.885	191	0.000

a. Lilliefors Significance Correction

Table 96: Listen to Audio Clips Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
OS search engine websites	0.288	191	0.000	0.780	191	0.000

a. Lilliefors Significance Correction

Table 97: Search Engine Websites Normality Test

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
OS scan Amazon for new books	0.215	191	0.000	0.864	191	0.000

a. Lilliefors Significance Correction

Table 98: Scan Amazon for New Books Normality Test

Appendix 14: Factor Analysis

Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared			Rotation Sums of Squared		
				Loadings			Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.293	20.356	20.356	4.864	18.707	18.707	2.563	9.858	9.858
2	2.645	10.174	30.531	2.352	9.048	27.755	2.558	9.838	19.696
3	2.338	8.991	39.522	1.888	7.260	35.015	2.084	8.015	27.712
4	2.190	8.423	47.945	1.726	6.639	41.654	1.871	7.196	34.908
5	1.654	6.360	54.305	1.183	4.548	46.202	1.714	6.593	41.501
6	1.277	4.910	59.215	0.873	3.356	49.558	1.710	6.576	48.077
7	1.098	4.222	63.437	0.598	2.298	51.857	.983	3.780	51.857
8	0.996	3.830	67.267						
9	0.973	3.742	71.009						
10	0.851	3.274	74.283						
11	0.775	2.982	77.265						
12	0.754	2.900	80.166						
13	0.664	2.553	82.718						
14	0.617	2.373	85.092						
15	0.551	2.121	87.213						
16	0.478	1.840	89.053						
17	0.409	1.573	90.625						
18	0.404	1.554	92.179						
19	0.367	1.410	93.590						
20	0.342	1.314	94.904						
21	0.325	1.249	96.153						
22	0.264	1.014	97.167						
23	0.249	0.958	98.126						
24	0.220	0.845	98.971						
25	0.183	0.705	99.676						
26	0.084	0.324	100.000						

Extraction Method: Principal Axis Factoring.

Table 99: Factory Analysis Total Variance

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
	1	5.293	20.356	20.356	5.293	20.356	20.356	2.967	11.411
2	2.645	10.174	30.531	2.645	10.174	30.531	2.752	10.585	21.996
3	2.338	8.991	39.522	2.338	8.991	39.522	2.507	9.643	31.639
4	2.190	8.423	47.945	2.190	8.423	47.945	2.289	8.805	40.444
5	1.654	6.360	54.305	1.654	6.360	54.305	2.265	8.713	49.157
6	1.277	4.910	59.215	1.277	4.910	59.215	2.162	8.316	57.473
7	1.098	4.222	63.437	1.098	4.222	63.437	1.551	5.965	63.437
8	0.996	3.830	67.267						
9	0.973	3.742	71.009						
10	0.851	3.274	74.283						
11	0.775	2.982	77.265						
12	0.754	2.900	80.166						
13	0.664	2.553	82.718						
14	0.617	2.373	85.092						
15	0.551	2.121	87.213						
16	0.478	1.840	89.053						
17	0.409	1.573	90.625						
18	0.404	1.554	92.179						
19	0.367	1.410	93.590						
20	0.342	1.314	94.904						
21	0.325	1.249	96.153						
22	0.264	1.014	97.167						
23	0.249	0.958	98.126						
24	0.220	0.845	98.971						
25	0.183	0.705	99.676						
26	0.084	0.324	100.000						

Extraction Method: Principal Component Analysis.

Table 100: Rotated Factor Component

Appendix 15: Inferential Statistics

	Methods	Chi-Square	P value	Mean rank				
				Very difficult	Difficult	Neither difficult nor easy	Easy	Very easy
AT	Databases or bibliographies	8.223	0.08	54.33	94.13	102.4	98.48	59.17
	Sharing websites	5.757	0.22	80.56	91.70	103.08	95.90	42.17
	Professional associations	5.579	0.23	72.89	87.98	98.25	108.9	116.0
AJ	Online table of contents	4.634	0.33	88.17	91.42	95.66	110.2	54.67
	Alert services	2.273	0.69	101.4	95.99	93.14	102.9	58.67
PE	Attend different events	9.806	0.04	103.9	81.67	99.25	113.1	127.0
	Scan list of conference papers	4.004	0.40	80.17	91.86	95.31	104.2	139.7
	Ask my colleagues	14.46	0.00	48.50	91.18	95.01	119.5	105.3
LS	Ask the library staff	6.378	0.17	86.17	86.35	98.89	105.9	61.50
	Visit the library or its website	10.47	0.03	70.94	91.15	106.2	92.95	27.50
	Scan the library shelves	5.557	0.23	82.83	90.67	100.3	104.8	46.50
SM	Post questions on social networks	3.780	0.44	96.28	97.00	91.87	105.8	56.50
	Follow certain academics or authors	7.904	0.10	79.67	99.68	91.12	109.3	33.00
	Follow the latest research conducted by research groups	2.526	0.64	82.67	95.15	94.21	103.9	61.83
	Follow the latest research conducted by significant independent researchers in my field	0.656	0.96	90.56	95.38	95.65	98.93	74.67
AS	Set up alert services to notify me of new papers	1.348	0.85	100.1	94.36	97.66	85.53	86.33
	Set up feeds for academic databases	0.322	0.99	95.78	94.25	95.81	92.63	80.00
CS	Cited by Google Scholar	4.104	0.39	85.50	96.14	93.32	107.6	50.17
	Use specialised applications to import all cited papers	3.416	0.49	73.83	100.7	98.22	88.37	73.33
	Follow references cited in an interesting paper	1.816	0.77	90.00	91.96	100.6	96.30	71.67
	Follow authors who cited interesting papers	4.716	0.32	71.44	96.68	102.6	83.80	93.67
MM	Look at technical diagrams	7.859	0.10	92.00	86.43	102.8	82.33	145.2
	Watch video clips	3.694	0.45	70.33	93.11	102.6	92.45	89.50
	Listen to audio clips	1.512	0.82	80.61	95.14	99.97	91.13	100.0
OS	Search engine websites	2.649	0.62	88.11	94.05	95.55	106.8	67.00
	Scan Amazon for new books	4.432	0.35	97.39	93.98	91.40	108.3	140.5

Table 101: Difficulty and KUTD Methods

	Had attended library KUTD training	Had taken other online courses	Would attend a training session to learn how to use KUTD services
Chi-Square	4.566	3.161	4.159
df	4	4	4
Asymp. Sig.	0.335	0.531	0.385

Table 102: Age and KUTD Training

	Had attended library KUTD training	Had taken other online courses	Would attend a training session to learn how to use KUTD services
Mann-Whitney U	4738.0	4745.0	3698.0
Wilcoxon W	8224.0	8231.0	9467.0
Z	-1.020	-.779	-1.134
Asymp. Sig. (2-tailed)	0.308	0.436	0.257

Table 103: Gender and KUTD Training

	Had attended library KUTD training	Had taken other online courses	Would attend a training session to learn how to use KUTD services
Chi-Square	8.342	7.298	17.751
df	6	6	6
Asymp. Sig.	0.21	0.29	0.00

Table 104: Position and KUTD Training

	Had attended library KUTD training	Had taken other online courses	Would attend a training session to learn how to use KUTD services
Chi-Square	3.063	1.867	1.417
df	2	2	2
Asymp. Sig.	0.216	0.393	0.492

Table 105: Faculty and KUTD Training

	Methods	Chi-Square	P value	Mean rank		
				Beginner	Competent	Expert
AT	Databases or bibliographies	13.93	0.00	70.62	99.41	117.0
	Sharing websites	2.393	0.30	89.99	93.90	110.3
	Professional associations	8.901	0.01	75.55	97.78	112.5
AJ	Online table of contents	14.88	0.00	69.21	98.88	117.4
	Alert services	1.602	0.44	85.53	97.26	96.63
PE	Attend different events	13.06	0.00	74.87	96.98	122.0
	Scan lists of conference papers	20.84	0.00	66.07	99.05	123.50
	Ask my colleagues	10.19	0.00	76.70	96.36	117.9
LS	Ask the library staff	1.116	0.57	96.96	91.07	100.6
	Visit the library or its website	0.034	0.98	94.44	95.48	93.48
	Scan the library shelves	2.615	0.27	105.0	93.27	85.50
SM	Post questions on social networks	0.805	0.66	100.1	93.32	90.37
	Follow certain academics or authors	0.458	0.79	96.17	95.21	87.61
	Follow the latest research conducted by research groups	0.220	0.89	94.46	94.74	89.22
	Follow the latest research conducted by significant independent researchers in my field	1.153	0.56	89.40	94.49	104.1
AS	Set up alert services to notify me of new papers	0.504	0.77	88.93	95.38	92.26
	Set up feeds for academic databases	.980	0.61	88.33	96.30	88.54
CS	Cited by Google Scholar	1.840	0.39	84.87	97.57	96.20
	Use specialised applications to import all cited papers	.811	0.66	92.43	97.30	87.50
	Follow references cited in an interesting paper	6.75	0.34	77.00	100.1	101.0
	Follow authors who cited interesting papers	0.022	0.98	94.98	94.73	96.50
MM	Look at technical diagrams	1.122	0.57	85.60	95.21	95.39
	Watch video clips	1.046	0.59	94.00	97.22	85.02
	Listen to audio clips	1.506	0.47	87.31	96.22	102.8
OS	Search engine websites	1.327	0.51	90.63	94.57	105.5
	Scan Amazon for new books	6.192	0.45	91.42	91.47	120.6

Table 106: Ability and KUTD Methods

Obstacles	Chi-Square	P value	Mean rank Age (years)				
			21-30	31-40	41-50	51-60	>60
Lack of awareness about how to use KUTD services	9.533	0.05	110.8	107.9	86.35	85.00	96.70
Lack of time to KUTD	6.478	0.16	94.81	113.52	107.95	112.0	97.60
There are no obstacles which affect my ability to KUTD	6.450	0.16	100.6	102.1	113.20	106.0	123.6

Table 107: Age and Obstacles

Obstacles	Chi-Square	P value	Mean rank	
			Male	Female
Lack of awareness about how to use KUTD services	4829.5	0.43	100.9	106.0
Lack of time to KUTD	4192.0	0.00	95.64	113.6
There are no obstacles which affect my ability to KUTD	4833.5	0.27	105.1	100.0

Table 108: Gender and Obstacles

Obstacles	Chi-Square	P value	Mean rank						
			Prof	Reader	Senior Lecturer	Lecturer	Research Fellow	Research associate	PhD
Lack of awareness about how to use keep-up-to-date services	18.52	0.00	82.86	101.3	83.42	91.35	75.50	96.10	117.3
Lack of time to keep up to date	16.34	0.01	108.6	125.1	138.0	110.3	112.25	110.5	90.79
There are no obstacles which affect my ability to keep up to date	6.239	0.40	114.1	104.9	92.00	111.8	92.00	98.87	103.8

Table 109: Position and Obstacles

Obstacles	Chi-Square	P value	Mean rank		
			Engineering	HASS	Sciences
Lack of awareness about how to use keep-up-to-date services	8.524	0.01	113.1	93.25	95.30
Lack of time to keep up to date	5.973	0.05	96.04	109.4	114.4
There are no obstacles which affect my ability to keep up to date	1.659	0.43	102.3	109.8	103.0

Table 110: Faculty and Obstacles

	Awareness of the services	Sought the help of a librarian	Would like help in using KUTD services	Ever used the library's KUTD services
Chi-Square	0.356	7.803	4.700	2.094
df	4	4	4	4
Asymp. Sig.	0.986	0.099	0.319	0.718

Table 111: Age and “Yes” and “No” Questions

	Awareness of the services	Sought the help of a librarian	Would like help in using KUTD services	Ever used the library's KUTD services
Mann-Whitney U	3922.5	1410	1452	1365.5
Wilcoxon W	7003.5	2445	3798	3711.5
Z	-1.112	-0.960	-0.489	-1.375
Asymp. Sig. (2-tailed)	0.266	0.337	0.625	0.169

Table 112: Gender and “Yes” and “No” Questions

	Awareness of services	Sought the help of a librarian	Would like help in using KUTD services	Ever used the library's KUTD services
Chi-Square	5.368	5.772	23.110	11.578
df	6	6	6	6
Asymp. Sig.	0.498	0.449	0.00	0.07

Table 113: Position and “Yes” and “No” Questions

	Awareness of services	Sought the help of a librarian	Would like help in using KUTD services	Ever used the library's KUTD services
Chi-Square	0.317	1.366	1.495	0.629
df	2	2	2	2
Asymp. Sig.	0.853	0.505	0.474	0.730

Table 114: Faculty and “Yes” and “No” Questions

	Setting up alert services	List of publications in your field	New content	Information needs
Chi-Square	9.599	8.201	10.45	5.844
df	4	4	4	4
Asymp. Sig.	0.05	0.084	0.03	0.211

Table 115: Age and Helpful KUTD Services

	Setting up alert services	List of publications in your field	New content	Information needs
Chi-Square	517.5	527.5	506.5	520.0
Wilcoxon W	1378.5	878.5	1367.5	871.0
Z	-0.228	-0.081	-0.386	-0.189
Asymp. Sig. (2-tailed)	0.820	0.936	0.700	0.850

Table 116: Gender and Helpful KUTD Services

	Setting up alert services	List of publications in your field	New content	Information needs
Chi-Square	11.82	12.74	7.601	11.65
df	6	6	6	6
Asymp. Sig.	0.066	0.047	0.269	0.070

Table 117: Position and Helpful KUTD Services

	Setting up alert services	List of publications in your field	New contents	Information needs
Chi-Square	0.670	3.535	0.667	1.521
df	2	2	2	2
Asymp. Sig.	0.72	0.17	0.72	0.47

Table 118: Faculty and Helpful KUTD Services

	Access links related to KUTD services	Set up KUTD services via library website	Help and support on KUTD services	Communicate with the library about KUTD services	Library services desk for KUTD enquiries	Support from the library when I need it
Chi-Square	10.82	13.81	9.59	7.934	4.552	5.812
df	4	4	4	4	4	4
Asymp. Sig.	0.03	0.00	0.05	0.094	0.336	0.214

Table 119: Age and Statements about KUTD Services

	Access links related to KUTD services	Set up KUTD services via library website	Help and support on KUTD services	Communicate with the library about KUTD services	Library services desk for KUTD enquiries	Support from the library when I need it
Mann-Whitney U	492.5	451.5	422.0	469.5	480.0	468.5
Wilcoxon W	817.5	776.5	747.0	794.5	805.0	793.5
Z	-0.286	-0.909	-1.412	-0.679	-0.530	-0.685
Asymp. Sig. (2-tailed)	0.775	0.363	0.158	0.497	0.596	0.493

Table 120: Gender and Statements about KUTD Services

	Access links related to KUTD services	Set up KUTD services via library website	Help and support on KUTD services	Communicate with the library about KUTD services	Library services desk for KUTD enquiries	Support from the library when I need it
Chi-Square	14.66	14.49	14.58	14.59	22.25	16.56
df	6	6	6	6	6	6
Asymp. Sig.	0.02	0.02	0.02	0.02	0.00	0.01

Table 121: Position and Statements about KUTD Services

	Access links related to KUTD services	Set up KUTD services via library website	Help and support on KUTD services	Communicate with the library about KUTD services	Library services desk for KUTD enquiries	Support from the library when I need it
Chi-Square	1.278	3.126	0.689	0.870	1.160	0.585
df	2	2	2	2	2	2
Asymp. Sig.	0.53	0.21	0.709	0.65	0.560	0.746

Table 122: Faculty and Statements about KUTD Services

Appendix 16: Canonical correlation Analysis

Note: Statistical Significance Tests for the Full CCA Model
 Effect ... Within Cells Regression Multivariate Tests of Significance (S=4, M=1 1/2, N= 80)

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sing. of F
Pillais	0.47554	2.81659	32.00	668.00	0.000
Hotellings	0.57847	2.93753	32.00	650.00	0.000
Wilks	0.59279	2.88680	32.00	606.40	0.000
Roys	0.24304				

Table 123: Multivariate Test of Significant

Root No.	Eigenvalue	Pct.	Cum. Pct.	Canon Cor.	Sq. Cor
1	0.32107	55.50419	55.50419	0.49299	0.24304
2	0.14573	25.19173	80.69592	0.35664	0.12719
3	0.07213	12.46971	93.16563	0.25938	0.06728
4	0.03953	6.83437	100.00000	0.19502	0.03803

Table 124: Eigenvalues and Canonical Correlation

Roots	Wilks L.	F	Hypoth. DF	Error DF	Sing. of F
1 To 4	0.59279	2.88680	32.00	606.40	0.000
2 To 4	0.78313	2.00724	21.00	474.34	0.005
3 To 4	0.89725	1.54126	12.00	332.00	0.108
4 To 4	0.96197	1.32046	5.00	167.00	0.258

Table 125: Dimension Reduction Analysis

Variable	Sq. Mul. R	Adj. R-sq.	Hypoth. MS	Error MS	F	Sing. of F
Age	0.08753	0.04381	2.58175	1.28936	2.00235	0.049
Gender	0.08223	0.03827	0.56980	0.30463	1.87046	0.068
Expert	0.14651	0.10562	5.85116	1.63284	3.58341	0.001
Position	0.21156	0.17379	15.91640	2.84148	5.60145	0.000

Table 126: Univariate F-Tests with (8,167) D. F.

Variables	1	2	3	4
Age	0.433	0.32796	-0.239	-1.094
Gender	-0.016	0.88444	1.447	0.55790
Expert	-0.229	-0.604	-0.421	-0.186
Position	0.615	-0.170	-0.3216	-0.37902

Table 127: Raw Canonical Coefficients for Dependent Variables

Variables	1	2	3	4
Age	0.503	0.379	-0.0278	-1.270
Gender	-0.009	0.498	-0.814	0.314
Expert	-0.309	-0.816	-0.569	-0.251
Position	1.141	-0.316	-0.596	-0.702

Table 128: Standardized Canonical Coefficients for Dependent Variables

Variable	1	2	3	4
Age	-0.400	0.431	-0.043	-0.807
Gender	-0.101	0.51011	-0.803	0.289
Expert	-0.593	-0.581	-0.466	-0.306
Position	.0891	-0.344	-0.114	0.275

Table 129: Correlations between Dependent and Canonical Variables

CAN. VAR.	Pct Var DEP	Cum Pct DEP	Pct Var Cov	Cum Pct Cov
1	32.87884	32.87884	7.99088	7.99088
2	22.54102	55.41986	2.86702	10.85790
3	21.96705	77.38691	1.47795	12.33585
4	22.61309	100.00000	0.86000	13.19585

Table 130: Variance in Dependent Variable Explained by Canonical Variable

COVARIATE	1	2	3	4
AT	-0.064	-0.61487	-0.454	0.212
AS	-0.742	0.716	-0.718	-0.699
PE	-0.798	0.14012	0.207	-0.211
LS	0.668	0.561	-0.510	0.009
SM	0.2130	0.469	0.197	0.642
CS	0.484	-0.642	0.366	1.009
MM	0.519	-0.332	-0.072	-0.485
OS	0.018	-0.009	0.901	-0.611

Table 131: Raw Canonical Coefficients for Covariates

COVARIATE	1	2	3	4
AT	-0.059	-0.567	-0.419	0.195
AS	-0.648	0.627	-0.628	-0.612
PE	-0.615	0.108	0.159	-0.163
LS	0.548	0.459	-0.418	0.008
SM	0.216	0.477	0.201	0.653
CS	0.449	-0.595	0.339	0.936
MM	0.474	-0.303	-0.065	-0.442
OS	0.014	-0.007	0.698	-0.474

Table 132: Standardized Canonical Coefficients for Covariates

Covariate	1	2	3	4
AT	-0.63	-0.480	-0.439	0.089
AS	-0.326	0.172	-0.289	0.090
PE	-0.451	0.173	0.120	-0.041
LS	0.505	0.482	-0.399	-0.201
SM	0.164	0.459	0.260	0.513
CS	-.099	-0.162	0.027	0.420
MM	0.501	-0.215	0.004	-0.307
OS	0.121	0.042	0.554	-0.356

Table 133: Correlations between Covariates and Canonical Variables

CAN. VAR.	Pct Var DEP	Cum Pct DEP	Pct Var COV	Cum Pct COV
1	2.64876	2.64876	10.89842	10.89842
2	1.28269	3.93145	10.08478	20.98321
3	0.69433	4.62579	10.32004	31.30325
4	0.34216	4.96795	8.99691	40.30017

Table 134: Variance in Covariates Explained by Canonical Variables

COVARIATE	B	Beta	Std. Err.	t-Value	Sing. of t	Lower- 95%	CL- Upper
AT	-12787	-0.10148	0.10081	-1.26845	0.206	-0.32691	0.07116
AS	0.43544	0.32778	0.16519	2.63607	0.009	0.10932	0.76157
PE	0.24387	0.16188	0.12807	1.90419	0.059	-0.00897	0.49672
LS	-0.04793	-0.3383	0.11483	-4.1744	0.677	-0.27465	0.17877
SM	-0.08493	-0.07434	0.09390	-0.90453	0.367	-0.27032	0.10045
CS	-0.41503	-0.33141	0.15640	-2.65373	0.009	-0.72381	-0.10627
MM	-0.88825	-0.06975	0.10630	-0.83564	0.405	-0.29869	0.12103
OS	0.09421	0.06287	0.12249	0.76913	0.443	-0.14762	0.33605

Table 135: Regression Analysis for WITHIN CELLS error term Dependent Variable .. Age

COVARIATE	B	Beta	Std. Err	t-Value	Sing. of t	Lower-95%	CL-Upper
AT	-0.00107	-0.00176	0.04900	-0.02195	0.983	-0.09782	0.09567
AS	0.15636	0.24285	0.08029	1.94746	0.053	-0.00215	0.31489
PE	0.00570	0.00781	0.06225	0.09160	0.927	-0.11720	0.12860
LS	0.08848	0.14396	0.05582	1.77095	0.078	-0.01135	0.20905
SM	0.03924	0.07087	0.04564	0.85975	0.391	-0.05087	0.12935
CS	-0.09029	-0.14876	0.07602	-1.18780	0.237	-0.24038	0.05979
MM	-0.05552	-0.08996	0.05167	-1.07465	0.284	-0.15753	0.04648
OS	-0.12658	-0.17430	0.05954	-2.12613	0.035	-0.24414	-0.00904

Table 136: Dependent Variable ... Gender

COVARITE	B	Beta	Std. Err	T-Value	Sig. of t	Lower-95%	CL- Upper
AT	0.25478	0.17377	0.11345	2.2457	0.026	0.0308	0.47876
AS	0.26632	0.17229	0.18589	1.4326	0.156	-0.1007	0.63332
PE	0.25899	0.14775	.14412	1.79707	0.074	-.02554	0.54354
LS	-0.33812	-0	0.12923	-2.6165	.010	-0.59325	-0.08299
SM	-0.29974	-0.22548	0.10567	-2.8365	0.005	-0.50836	-0.09111
CS	-0.15294	-0.10496	0.17600	-0.8690	0.386	-0.50042	0.19453
MM	-0.06158	-0.04156	0.11962	-0.51487	0.607	-0.298	0.17458
OS	-0.10266	-0.05887	0.13785	-0.7447	0.457	-0.37481	0.16948

Table 137: Dependent Variable .. Expert

COVARIATE	B	Beta	Std. Err	t-Value	Sing. of t	Lower-95%	CL-Upper
AT	0.13328	0.06624	0.14966	0.89063	0.374	-0.16218	0.42875
AS	-0.79763	-0.37596	0.24522	-3.2527	0.001	-1.2818	-0.31350
PE	-0.71400	-0.29678	0.19012	-3.7554	0.000	-1.0894	-0.33865
LS	0.44530	0.19682	0.17047	2.61221	0.010	0.10875	0.78186
SM	0.11979	0.06566	0.13940	0.85936	0.391	-0.15542	0.39500
CS	0.62059	.31029	0.23218	2.67298	0.008	0.16222	1.07898
MM	0.45440	0.223450	0.15780	2.87966	0.005	0.14287	0.76595
OS	0.09328	0.038981	0.18184	-0.51302	0.609	-0.45229	0.26572

Table 138: Dependent Variable.. Position

Importance and Ability

Note: Statistical Significance Tests for the Full CCA Model

Effect ... Within Cells Regression Multivariate Tests of Significance (S=3, M=2, N= 81 1/2)

Test Name	Value	Approx. F	Hypoth. DF	Error DF	Sing. of F
Pillais	.34134	2.68014	24.00	501.00	.000
Hotellings	.42378	2.88994	24.00	491.00	.000
Wilks	.68452	2.78737	24.00	479.15	.000
Roys	.23947				

Table 139: Multivariate Test of Significant

Root No.	Eigenvalue	Pct.	Cum. Pct.	Canon Cor.	Sq. Cor
1	.31487	74.30053	74.30053	.48936	.23947
2	.08318	19.62919	93.92972	.27712	.07680
3	.02572	6.07028	100.00000	.15836	.02508

Table 140: Eigenvalues and Canonical Correlation

Roots	Wilks L.	F	Hypoth. DF	Error DF	Sing. of F
1 To 3	0.68452	2.78737	24.00	479.15	0.000
2 To 3	0.90005	1.28207	14.00	332.00	0.216
3 To 3	0.97492	0.71600	6.00	167.00	0.637

Table 141: Dimension Reduction Analysis

Variable	Sq. Mul. R	Adj. R-sq.	Hypoth. MS	Error MS	F	Sing. of F
Importance	0.12680	0.08497	0.74315	0.24516	3.03131	0.003
Difficulty	0.07058	0.02606	1.12052	0.70680	1.58534	0.133
Ability	0.21170	0.17393	3.41223	0.60869	5.60588	0.000

Table 142: Univariate F-Tests with (8,167) D. F.

Variables	1	2	3
Importance	0.715	-1.769	0.573
Difficulty	0.231	-0.251	-1.181
Ability	0.889	0.799	0.370

Table 143: Raw Canonical Coefficients for Dependent Variables

Variables	1	2	3
Importance	0.370	-0.916	0.2967
Difficulty	0.197	-.214	-1.005
Ability	0.767	0.686	0.318

Table 144: Standardized Canonical Coefficients for Dependent Variables

Variable	1	2	3
Importance	0.576	-0.769	0.276
Difficulty	0.458	0.101	-0.883
Ability	0.912	0.399	0.094

Table 145: Correlations between Dependent and Canonical Variables

CAN. VAR.	Pct Var DEP	Cum Pct DEP	Pct Var Cov	Cum Pct Cov
1	45.784	45.784	10.964	10.964
2	25.376	71.159	1.9487	12.913
3	23.840	100.00	0.723	12.636

Table 146: Variance in Dependent Variable Explained by Canonical Variable

COVARIATE	1	2	3
AT	0.505	0.481	0.260
AS	0.082	-0.823	1.549
PE	1.130	-0.141	-0.513
LS	-0.220	-0.540	-0.772
SM	-0.144	-0.364	0.101
CS	-0.311	0.562	-0.949
MM	-0.034	-0.474	0.119
OS	0.232	0.460	-0.152

Table 147: Raw Canonical Coefficients for Covariates

COVARIATE	1	2	3
AT	0.469	0.448	0.242
AS	0.071	-0.719	1.354
PE	0.878	-0.0109	-0.399
LS	-0.181	-0.443	-0.633
SM	-0.147	-0.369	0.103
CS	-0.289	0.521	0.878
MM	-0.031	-0.430	0.108
OS	0.180	0.357	-0.118

Table 148: Standardized Canonical Coefficients for Covariates

Covariate	1	2	3
AT	0.530	0.192	0.2623
AS	0.299	-0.385	0.514
PE	0.855	-0.323	-0.197
LS	0.041	-0.588	-0.412
SM	0.125	-0.481	-0.016
CS	0.185	-0.087	0.123
MM	0.193	-0.464	-0.091
OS	0.334	0.025	-0.173

Table 149: Correlations between Covariates and Canonical Variables

CAN. VAR.	Pct Var DEP	Cum Pct DEP	Pct Var COV	Cum Pct COV
1	3.923	3.922	16.377	16.377
2	1.046	4.968	13.625	30.001
3	0.187	5.155	7.457	37.458

Table 150: Variance in Covariates Explained by Canonical Variables

COVARIATE	B	Beta	Std. Err.	t-Value	Sing. of t	Lower- 95%	CL- Upper
AT	0.02647	0.0475	0.04327	0.61170	0.542	-0.05895	0.11189
AS	0.13783	0.23267	0.07200	1.91418	0.057	-0.00433	0.27998
PE	0.16898	0.25344	0.05513	3.06498	0.003	0.06013	0.27783
LS	0.00999	0.01583	0.05017	0.19925	0.842	-0.08905	0.10904
SM	0.02143	0.04205	0.04098	0.52286	0.602	-0.05948	0.10234
CS	-0.12907	-0.23074	0.06804	-1.89703	0.060	-0.26339	0.00526
MM	0.05002	0.08769	0.04638	1.07854	0.282	-0.04154	0.14159
OS	-0.02028	-0.0304	0.05327	-0.38075	0.704	-0.12545	0.08489

Table 151: Regression analysis for WITHIN CELLS error term Dependent Variable .. Importance

COVARIATE	B	Beta	Std. Err	t-Value	Sing. of t	Lower-95%	CL-Upper
AT	05398	0.05891	0.07347	0.73479	0.463	-0.09106	0.19902
AS	-0.14945	-0.15329	0.12226	-1.22243	0.223	-0.39083	0.09192
PE	0.28051	0.25563	0.09361	2.99648	0.003	0.09569	0.46533
LS	0.06275	0.06037	0.08518	0.73662	0.462	-0.10543	0.23092
SM	-0.03092	-0.0369	0.06959	-0.44439	0.657	-0.16831	0.10646
CS	0.04019	0.04366	0.11552	0.34796	0.728	-0.18788	0.26828
MM	-0.00954	-0.01016	0.07875	-0.12116	0.904	-0.16502	0.14593
OS	0.05165	0.04699	0.09045	0.57113	0.569	-0.12691	0.23023

Table 152: Dependent Variable ... Difficulty

COVARITE	B	Beta	Std. Err	T-Value	Sig. of t	Lower-95%	CL- Upper
AT	0.24255	0.26269	0.06818	3.55784	0.000	0.10796	0.37716
AS	-0.02719	-0.02768	0.11346	-0.23968	0.811	-0.25119	0.19680
PE	0.41338	0.37386	0.08687	4.75845	0.000	0.24187	0.58490
LS	-0.14562	-0.13905	0.07905	-0.18422	0.067	-0.30169	0.01044
SM	-0.08856	-0.10478	0.06458	-1.37140	0.172	-0.21605	0.03893
CS	-0.07815	-0.08424	0.10721	-0.72896	0.467	-0.28981	0.13351
MM	-0.05671	-0.05995	0.07308	-0.77607	0.439	-0.20100	0.08756
OS	0.13089	0.11816	0.08394	1.55941	0.121	-0.03482	0.29661

Table 153: Dependent Variable .. Ability

Appendix 17: Interview Protocol

KUTD definition: the recognition or discovery of interesting information or data by following indirect strategies to encounter information. This recognition can be achieved by adopting either active or passive approaches of KUTD. The former approach involves different types of actions and social interactions with the surrounding environment whereas the latter involves awareness or discovery of information by chance, with no direct actions being taken, such as via reliance on notification systems and tools which present the passive KUTD.

Q1 What do you think about KUTD is it important and if so why?

Q2 Why do you use this tool or why do not use this tool? (i.e what is the role of PE in KUTD) ? See the table below.

Q3 what are the different factor or motivation of using particular method to KUTD?

Q4 How can the University can help you in KUTD?

Q5 How can the library help you in KUTD?

Q6 Would you like to add anything or comments?

Q7 Can you recommend anyone could be interested in KUTD to take part in the interview?

Q13 In order to keep up to date with the latest development in my field I regularly:

Group name	Different ways or tools	Nerve	Rarely	Sometimes	Often	Very often
Academic Tools (AT)	1-Use academic databases or bibliographies (such as Science Direct, Web of Science and EBSCO)					
	2- Use academic sharing websites (such as Research Gate or Academia)					
	3-Use professional associations (such as communication through newsletters and websites)					
Academic Journal (AJ)	4- Scan the online table of contents of journals in my field					
	5-Set up alert services for academic journals					
People and Event (PE)	6-Attend different events (such as conferences, seminars and workshops)					
	7-Scan lists of papers in conferences					
	8-Ask my colleagues					
Library Services (LS)	9-Ask the library staff					
	10-Visit the library or its website					
	11-Scan the library shelves					
Social Media (SM)	12-Post questions on social networks (such as Facebook or Twitter)					
	13-Use social media websites to follow certain academics or authors					
	14-Follow the latest research conducted by research groups					
	15-Follow the latest research conducted by significant independent researchers in my field					
Alert Services (AJ)	16- Set up alert services to notify me of new papers					
	17-Use alert services and feeds for academic databases					
Citation Services (CS)	18-Use 'cited by' in Google Scholar to see who has cited papers					
	19-Use specialised applications to import all cited papers (such as Clowiz, RefWorks and Mendeley)					
	20-Follow references cited in an interesting paper					
	21-Follow authors who cited interesting papers					
Multimedia (MM)	22-Look at technical diagrams (such as charts, plans, schema and models)					
	23-Watch video clips (such as TED talks, itunesU, Geoset , EdX)					
	24-Listen to audio clips (such as academic podcasts, lectures, radio)					
Other Sources (OS)	25-Use search engine websites (such as Google, Google Scholar, Yahoo and Bing)					
	26-Scan Amazon for new books					

Appendix 18: Interview Email Invitation

Dear,

Firstly, I hope you have had a lovely holiday and happy New Year.

My name is Nouf Alshareef and I am a PhD student in the Department of Computer and Information Sciences at the University of Strathclyde, researching how academics and PhD students keep up to date with the latest developments in their fields. I am really excited about this work as I think it will ultimately be useful for both academics and PhD students to help them understand different ways of keeping up to date, designing better training and dealing with the enormous amount of information that is out there.

I would like to thank you for taking part in my questionnaire and for volunteering to take part in a follow-up interview. The questionnaire was investigating how academics and PhD students keep up to date and which key factors influence this ability to keep up to date.

Your participation in this interview will be highly appreciated. It will add depth to this ongoing research.

If you could contact me on this email address at your convenience, to arrange a date and time. Based on recent interviews, this should take less than an hour.

I appreciate your time and your cooperation

Thank you

Nouf

Appendix 19: First Gentle Remainder

Dear,

Just a quick reminder that our meeting is today at 2. Can we meet in my office which is in the 12 floor and the office number is 12.14, if that suit you otherwise I will come to your office.

The department address

Computer & Information Sciences Livingstone Tower

26 Richmond Street

Glasgow, G1 1XH

Looking forward to meet you.

Nouf

Appendix 20: Second Remainder

Dear,

I hope you are well and thank you for taking part in my questionnaire and volunteering for a follow-up interview I thought I would send you a gentle reminder regarding my previous email. I will be carrying out more interviews soon and would love your help if you have some spare time?

Many thanks,

Nouf

Appendix 21: Interview Information Sheet

My name is Nouf Alshareef and I am a PhD student at Strathclyde University, researching how academics and PhD students keep up to date with the latest developments in their fields. I'm really excited about this work as I think it will ultimately be useful for both academics and PhD students, to help them both understand different ways of keeping up to date and obtaining better training that enables them to deal with the enormous amount of information that is out there.

Research Title

Developing a framework to optimize the benefits of current awareness

I am inviting you to take part in this research, as academics are a key element in developing a framework which aims to facilitate their abilities of keeping up to date.

I would like to provide a brief summary of the research to explain the rationale behind it and what it involves. So, please take your time to read this through before you decide whether or not to take part in the research.

Please feel free to ask should you have questions, want more information or find something to be unclear.

What is the purpose of the Research?

The purpose of the research is developing a better understanding of how academics and PhD students keep up to date with the latest developments in their fields. By seeking to understand how academics stay up to date, the research will identify different obstacles and elements that affect this ability of keeping up to date, with a view to creating a framework that overcomes these issues. The framework will also identify a variety of tools, services and strategies which academics can use in order to keep up to date.

Who will be involved?

The research is a case study of Strathclyde University and it will focus on academic staff and PhD students from different disciplines across the University of Strathclyde. Quantitative data will come from online questionnaires, and, for those who volunteer to provide further information, qualitative data will come from interviews.

Do I have to take part?

Participants are free from any obligation to take part in the online questionnaire or the interview. All participants who decide to take part in the research need to read the information sheet and sign a consent form when attending the interview. Interviews will be recorded for analysis and recordings will be kept securely and confidentially. Participants will be free to withdraw at any time.

If you take part in the research, what will happen?

Frequency	Method	Duration	What will participants do?	What will happen next?
INTERVI One	face to face meeting	45- 60 mins	4- Receive an interview invitation to take part in the interview. 5- If you agree, read the information sheet. 6- Read the consent form to be and signed during the interview	The data will be confidentiality analysed and interpreted.

Will my participation in the research be kept confidential?

Yes, the data will be kept confidential:

- Participants will be identified by an ID number rather than by name.
- Data will be used for the purpose of the research only.
- Only authorised people, such as academic supervisors will view the data.
- Online applications and software used to store, generate or analyse data will be password protected, e.g. Qualtrics.
- A password-protected laptop, accessible only to me, will be used to store any other electronic data.

What if I do not want to carry on with the research?

Participants have the right to withdraw at any time from the data collection process and any data already collected will be destroyed immediately in this case.

How I will use the result of the research?

The research will be published and the results will be available for participants to view.

For further information

Please contact me on

E-mail: nouf.alshareef@strath.ac.uk

University of Strathclyde

Signature of the researcher: -----

Appendix 22: Consent form for the Research Interviews

- 1- Nouf has explained the purpose of her research and I have the opportunity to ask her for clarification if needed.
- 2- I do agree to take part in Nouf's research about keeping up to date
- 3- My participation is voluntary.
- 4- I can withdraw any time I want.
- 5- I do understand that interview quotes may be used in the thesis which will be published later.
- 6- I am happy with arrangements regarding the recording of my interview.
- 7- I am happy with arrangements to keep the audio recording and transcript of the interview secure to ensure confidentiality.

Name of participant: -----

Signature of participant: ----- **Date** -----

Signature of the researcher: -----