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Assessing the Information Needs of Historians Working with Digitised Primary Sources in the UK: A Sequential Mixed Methods Study

Luna Hassan

A thesis submitted to the University of Huddersfield in partial fulfilment of the requirements for the degree of Doctor of Philosophy

October 2013

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Abstract

The way that historians do research has changed as more and more digitised primary sources have become available online. Whilst desktop access to historical resources is becoming the norm in the digital age, many historians prefer working with original sources. This observation triggered an investigation into the information needs and behaviour of historians with a view to identifying ways in which information retrieval system (IRS) might be enhanced to meet their specific needs. During the investigation it became apparent that the information-seeking behaviour (ISB) of historians involves a great deal of creative thinking and that IRS aimed at historians would benefit from features specifically designed to stimulate their creativity. The research described here follows a "mixed methods" approach in which quantitative and qualitative research techniques have been applied sequentially. The first, quantitative, phase of the study concerned the question of which format of primary sources (original or digitised) historians prefer to work with and why. Results from an online questionnaire, distributed to historians in the UK, revealed the historians' preference for originals but with a very positive attitude towards digitised sources, which were considered to be more "useful". This led the study to explore ways in which the "usefulness" of IRS could be further improved to support historical research. The exploration of these issues involved a qualitative analysis based on "grounded theory" techniques and led to certain specific recommendations to the designers of future IRS intended to support historical research.

Keywords: information needs, information-seeking behaviour, digitised primary sources, creativity, and historical research.

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Dedications and Acknowledgements

This thesis is dedicated to the little smiles that bright my life (Ali, Aya, Maya, and Naya) and to Loay the one who was always there to encourage and support and deal with my absence.

I would like to express the deepest thanks and appreciation to Dr. Steve Wade, Julie Wilkinson, and Graham Gibbs. This thesis would not have been achieved without their guidance, persistent help, and support.

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List of abbreviations

IT Information technology

IRS Information retrieval system

IS Information system

ISB Information-seeking behaviour

Introduction

History does not belong only to where it was created; it interests the whole universe. Imagine, from this regard, the amount of information that the world misses by having no electronic access to more than 5 million records in the Historical Archives Museum in Syria the land of civilisations. Currently, the museum is in the process of digitisation although many years are required before achieving real results. Essentially, digitisation is one of the fruitful results of applying the advance of Information Technology (IT) in libraries and archives. Since the 1980s, digitisation has been developed from being an experience, to one of the libraries' tasks (Smith, 2006) to become a commercial industry today (Terras, 2008).

The impact of IT on our life is perceived on three levels: global, organisational and individual (Rainer and Cegielski, 2011). In the same way IT has changed the way that historians work, and the way archives manage their contents and provide services. IT, by the means of digitisation, helps saving history for future generations and makes it accessible worldwide. However, the importance of this lies in the fact that IT has remarkably influenced the historians' way of doing research, especially that desktop access currently becomes the norm (JISC, 2005).

Primary sources are the backbone of historical research. They were accessed only by visiting archives. This entitled historians to wade through archives, searching paper catalogues, browsing shelves and boxes of photos, scanning hundreds of records and manuscripts, writing notes for endless hours. This laborious yet enjoyable work was certainly the situation of historians in olden days. Currently, there is a virtual version of this picture that can be summarised as an online visit to archives. Historians now access archival materials from their computers at their convenience saving their time, money and effort and freeing themselves from archives' routine.

Apparently, this is an ideal situation; however, in reality historians prefer working with original primary sources despite the advantages gained by using digitised primary sources. This stimulates the enquiry of what cannot be captured in the digital formats. In other words, are there any information needs of historians that are not satisfied in the current IRS of digitised primary sources?

However, before proceeding to the rationale of this research, aims and objective, it is beneficial to provide a brief demonstration about digitisation.

Digitisation

Digitisation is the conversion from analogue to digital form (Youngs, 2001) to facilitate mainly materials' preservation and access. The undirected origin of digitisation goes back in time to the invention of photography by Daguerre and Fox Talbot in 1839, and facsimile machine in 1951 by Frederick Bakewell; however, the first digitisation initiation was in 1984 in Washington by the National Archive and Record Administration (NARA) (Terras, 2008). Terras mentioned in her book *Digital Images for the Information Professional* three stages in developing digitisation starting from the 1980s. Digitisation has been developed from an experience to become an operational task in libraries (Smith, 2006) offering a valuable opportunity in saving their precious collections and making them available worldwide. It is now a commercial industry (Terras, 2008) and it may have an opportunity to develop into personal applications rather than remaining in the domain of libraries.

Mainly, digitisation serves the purposes of access and preservation (Berger, 1999; Smith, A., 1999, 2001; Stefano, 2000; Lee, 2001; Youngs, 2001; IFLA, 2002; Britz and Lor, 2003; Holley, 2004;; Smith, N. 2006; Wentzel, 2006, NARA, 2009; Bansode, 2008; Terras, 2008; Dobreva, 2009; Young, 2009) in addition to create surrogate for fragile sources. Sharing sources is another good reason to carry out joint digitisation projects where institutions share cost and sources (IFLA, 2002; Smith, N. 2006). Of these reasons, access and preservation are believed to be the strongest motivations beyond digitisation, and it is pointless to separate them (Smith, 2001).

Digitisation lifecycle

Digitisation project requires several sources (human, financial, and technical), and it is carried out through different phases starting with project planning, preparing for digitisation, implementation phase; and finally project maintenance.
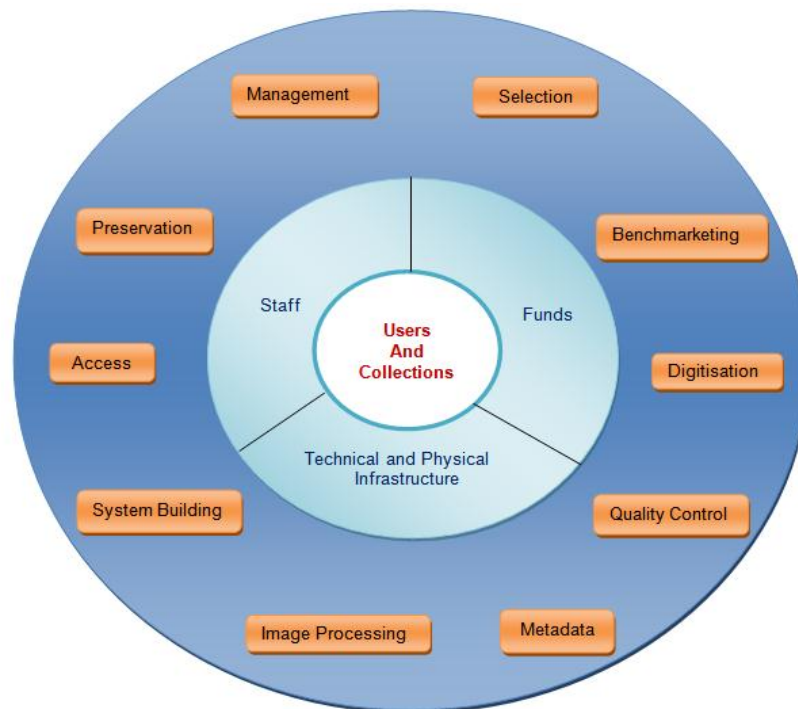
Figure 1: Digitisation lifecycle (Kenney and Rieger, 2000: 16)

Kenney and Rieger (2000) placed users and collections in the heart of their digitisation management wheel (figure 1), which serve as the core interest in a fundamental base that all the surrounding factors work to satisfy.

Planning is essential

Digitisation is not just about applying new technologies; it is more about the vision of institution, planning and users. Smith (2001) revealed the strategic view of project mission and lifecycle planning as the key sustainable factors in assessing digitisation projects. It is extremely necessary to have a clear and shared vision in an institution before undertaking a digitisation project to avoid any failure (Tanner, 2001; Kenney and Rieger, 2000).

It is very essential to determine whether a project is self or externally funded (Hammond and Davies, 2009; Yeates and Guy, 2006) by private or governmental bodies such as the *Joint Information Systems Committee* (JISC) that has spent over £28 million funding digitisation projects during the last 9 years (JISC, 2013). Similarly professional staff are important, in association with acquiring sufficient IT infrastructure in types of hardware (computers, scanners, digital cameras) and software (XML editor, Optical Character Recognition (OCR), Portable Source Format (PDF), and Tagged Image File Format (TIFF) (Terras, 2008).

Having a decision about carrying out a digitisation project is not so simple; everything should be clear and planned regarding the institution goals, users, human and financial sources, and IT developments.

Selection strategy

Since it is not possible to digitise the whole collection at once due to cost, time, and the unavailability of sources; archives and libraries need to decide which sources to digitise first. Selection strategy can be use driven (Smith, 1999) by selecting the most used collection, also it can be surrogate driven, especially for fragile sources. Selection for collaborative projects is based on selecting special collections to share them with other archives and libraries. Clearly, there are different elements to be considered when selecting materials; however, the primary one should be users' needs to satisfy their information needs and facilitate an online access of sources that interest them more.

Once the materials are selected, it is time to prepare them for the scanning process by creating records or database of these materials and ensuring no duplications (Young, 2006). Sometimes sources require special treatments before scanning such as unbinding and unfolding if necessary, and identifying whether any special requirements of scanning are needed. Meanwhile, when outsourcing scanning is approached, it is necessary to ensure secure transport of these sources.

Converting analogue into digital

Creating digital images from analogue materials is the backbone of digitisation projects; by using different types of scanners and digital cameras according to the requirements of selected sources. Image quality, resolution, bit depth, compression and quality control (IFLA, 2002) should be well applied to ensure matching originals. Meanwhile Rieger (2000) argued that quality control should be measured in every stage of the project not only when the actual scanning is done.

There are several types of metadata that can be built in digitisation projects such as bibliographical, technical, preservation and structural (Young, 2006) where each of which serves different purposes. However, bibliographical metadata is considered to be essentially required to facilitate sources retrieval (Lagoze and Payette, 2000; IFLA, 2002) by indexing and classifying digital images.

Maintaining the project

It is essential to guarantee the permanent progress of digitisation project along with the constant match of users' current and future needs. IFLA (2002) emphasised the importance of this stage to ensure project longevity; recommending the necessity of:

- Adopting an adequate data management method to facilitate both of the preservation and access purposes;

- Managing and developing human, financial, and technical sources;

- Constant development of metadata and delivery system;

- Developing a monitor strategy and considering users' demands and feedbacks.

Indeed, a digitisation project should be developed in the light of users' needs and demands; taking into consideration the continuous supply of digitised sources and not stopping the scanning process by the end of the selected list of sources.

Generally, digitisation projects are expensive due to the cost of equipment, procedures of preparing sources, copyright, database, and salaries (see appendix A), and thus it is very vital for such projects to be well planned and user-centred first of all.

In the UK, over £130 million has been invested in digitisation during the period 1995-2005; where lots of projects were carried out in the absence of a unified framework for digitisation in the UK, along with the poor assessments of users' needs and seeking behaviour (JISC, 2005). In this regard, JISC (2005) recommended digitisation projects to carry out continuous and periodical investigations of users' needs because information needs and seeking behaviour of users change through time and respond to developments in IT.

Rationale of the study

Literature is not rich with user studies that concerned historians as a user group in which from 1981 to 2004 there are only twenty scholar studies (Smith, 2004) that investigated the historians' use of information sources in general (Stieg, 1981), archival sources in particular (Beattie, 1989; Orbach, 1991; Duff, et al 2004a, b), electronic technologies and electronic sources (Andersen, 1998; Graham, 2000, 2001, 2002). Other scholars were attracted to study the cognitive side of historians in doing research, and organising information (Case, 1991 a, b), and how historians seek information (Cole, 1998, 2000a; Dilgadillo and Lynch, 1999; Duff and Johnson, 2002; Dalton and Charnigo, 2004), find sources (Tibbo, 2003 a, b; Anderson, 2004) and retrieve information (Cole, 2000b).

The information needs of historians (Stieg, 1981; Hernon, 1984) were studied in an early time when the impact of technology on the field of history was still minor; where books, articles and manuscripts were shown to be the most used sources. Delgadillo and Lynch (1999) examined the information-seeking behaviour of PhD historian students to discover how they search for information and assess their attitudes towards using new technologies, to find the leading role of printed sources, which was remarkably supported by the faculty.

Tibbo (2002, 2003a, 2003b) was interested in how historians search for and locate their primary sources in the electronic environment; however, the results showed that historians greatly relied on printed finding aids more than the electronic ones in both searching and teaching. This study coincides with another study of Anderson (2004) who shared the same interest as Tibbo; to similarly find that historians use printed finding aids in the first place, along with showing a good usage of electronic and informal ways of locating primary sources.

Stieg (Dalton later) revisited her study in 1981 with Charnigo in 2004 to discover whether any changes had occurred to the historians' information needs and sources. Dalton and Charnigo (2004) studied the information sources of historians, how historians locate their sources and use electronic sources. Dalton and Charnigo found that historians' search behaviour and information sources were comparatively changed since 1981 particularly in terms of using electronic databases though printed materials were still in the lead.

Duff et al (2004a) surveyed the historians' use of archival materials to reveal that historians prefer using original sources most and believe that originals are most useful. Moreover, historians prefer using the informal ways of finding sources (archivists and colleagues) more than bibliographies, indexes, or online search tools.

The historians' preference for original sources is undeniable, nonetheless having positive attitudes towards technology and electronic sources (Andersen, 1998; Delgadillo and Lynch, 1999; Graham, 2000, 2001, 2002), in addition to the continuous development of IT could reveal a significant impact on historians' preference and usage of information sources. In the literature, there is a little interest in digitised primary sources even though the promising role of digitised sources has been mentioned. Duff et al (2004 b) stated the potential role of digitisation as a supportive searching tool rather than alternative for primary sources. Clearly, this study considers digitised primary sources as alternative for originals, and argues for their role in increasing the productivity of historians in terms of saving their time and effort; especially that desktop access has essentially become a demand in the digital age.

The significance of this study concerns historians' use of digitised primary sources that none of the previous studies investigated in depth. Further this study pays a particular interest to the information needs and seeking behaviour(s) of historians in order to develop an IRS of digitised primary sources that stimulates the creativity of historians.

Questions of the study

The questions that have been raised in this domain are:

- What is the historians' preferred format of primary sources (originals or digitised)? Which format is the most useful to historians? The literature revealed original sources as the preferred format of historians, and the last study that confirmed this was dated in 2004 in Canada (Duff et al, 2004 a, b). However, the current research cannot take this statement on guarantee, especially that IT develops in such a rapid manner in which digitising historical sources would have been approached in a more appropriate method than in 2004. Having a different context and different period of time could reveal new results.

- What information needs, satisfied by original sources, cannot be met by digital formats? In other words, do historians need more information when searching virtually?

- In which way(s) do historians stimulate their creativity during their research? Being creative entails coming up with a novel and valuable idea (Weisberg, 1993; Sternberg, 2006). The relationship between creativity and information seeking is complex. Intuitively searchers begin with a high level of uncertainty about the nature of the issue or problem they are investigating. During the course of a search this uncertainty decreases until (ideally) the searchers reach the end of their searching with an original and useful solution or outcome. Creativity relates to the identification of a solution or fresh perspective on the problem situation. In historical research creativity is often associated with a reinterpretation of the causes of some historical events perhaps in the light of newly uncovered information. So how can historians be creative?

- What is missing in the current IRS of digitised primary sources? Or what features can be added to IRS of digitised primary sources to better help to satisfy the information needs of historians and to stimulate their creativity?

Aims and objectives

This research focused on a thorough investigation of the information needs of historians working with original and digitised primary sources. The major emphasis has been placed on examining and understanding the information needs and seeking behaviour of historians that they employ to meet those needs. It was believed that this investigation will contribute to the development of an interactive IRS for the digitised historical source collection particularly to stimulate the creativity of historians. This study aims to:

- Identify the required components of IRS of historical digitised primary sources;

- Gain fresh insights into creativity in the historical context;

- Gain a clear idea as to in which ways this IRS could stimulate the creativity of historians.

These aims are going to be achieved by:

- Identifying and understanding the information needs of historians in terms of their information sources preference, methods of locating primary sources, and discovering whether there are any needs that cannot be satisfied without referring to original sources rather than their digitised counterparts. This was approached by a survey study using online questionnaire distributed to historians in the UK.

- Modelling the ISB of historians working with original and digitised primary sources, and paying more attention to the historians' strategies of stimulating creativity. This was carried out by a grounded theory approach using semi-structured interviews.

Undoubtedly, understanding the information needs and seeking behaviour of historians should facilitate the design and development of any IRS of digitised primary sources, at which this research is targeted.

Overview of chapters

Here is a brief outline of chapters involved in this thesis:

Introduction: provides a background of the study in which digitisation has been reviewed showing how complex and costly it is for which it should always be user centred. User studies of historians are reviewed to identify the significance of the study. Questions, aims and objectives of the study are demonstrated, ending in chapters outlines.

Chapter one: literature review

Regarding theoretical perspectives, this chapter reviews three related areas:

- Part 1: Information Retrieval Systems: the basic object of IS is collecting, organising and storing information to facilitate its retrieval. Using computer in IS along with database technology largely contributes to modern IRS. Mechanism of IRS is reflected by two main processes: indexing and retrieving. Classical retrieval models (Boolean, Vector, probabilistic) shows different ways of matching search query with indexed documents to retrieve and list relevant documents. IS success model is considered because recall and precision are seen to not be the only criteria for evaluating IRS.

- Part 2: Information Needs and Seeking Behaviour: greater emphasis in this part is placed on the users of IRS. Understanding the information needs and seeking behaviour is believed to assist the design and improvement of IRS. Information needs arise when knowledge is inadequate to deal with situation or solve problem, which triggers the ISB in order to fulfil this need. General models of ISB are presented, and a particular emphasis is paid to studies that concerned the ISB of historians.

- Part 3: Creativity: creativity refers to the production of novel ideas. Different perspectives are reviewed regarding the nature of creativity where some said it to be a

trait, while others argued it to be acquired by training and practice. Earlier models of creative thinking involve both cognitive and unconscious processes, while later models concern only the cognitive processes. Creativity contributes to research fields in different ways according to conceptual space of individuals. Stimulating creativity through IS is the major concern here where several studies are reviewed.

Chapter two: Methodology illustrates and justifies the design of this study regarding the philosophical background, the mixed methods design that was applied sequentially in two phases: quantitative; the survey method that was deployed using an online questionnaire, and finally the qualitative phase, where grounded theory was approached using semi-structured interviews. Ethical issues are thoroughly considered in the research and the procedures followed are fully explained and illustrated.

Chapter three: Questionnaire results are presented and discussed in the light of previous studies. Results confirm the historians' preference for original sources; however, the new finding is that historians who responded to this questionnaire consider digitised primary sources more useful than the originals.

Chapter four: interview results are presented in three main parts:

- Part 1: demonstrates the ISB of historians that involves five stages (identifying need, following information, access, judging relevance, and absorbing/using information).

- Part 2: demonstrates historians' strategies for stimulating creativity whilst doing research; revealing several ways of stimulation such as: redirecting research, dealing with a wide range of sources, thinking, interaction and being inspiriting by others' works.

- Part 3: demonstrates the proposed enhancements to the IRS of digitised primary sources concerning: searching facilities, metadata, digitised sources, system,

interacting tools, personalising profile, training, and finally seeking and providing professional assistance.

Chapter five: Discussion: where results from the questionnaire are combined with the results from the interviews and discussed in the light of previous studies; highlighting the importance of these findings.

Conclusion where the overall aim of the thesis is re-stated, findings are re-considered in terms of answering the proposed questions and evaluated against a set of criteria defined by Charmaz (2006): credibility, originality, resonance, and usefulness. Contributions to knowledge and field are stated along with limitations and further works.

Summary

Background to the study has been illustrated in relation to digitisation that was considered to be a milestone in providing the online access of historical primary sources and saving history for future generations. Digitisation projects were shown to be complex and expensive for which JISC (2005) recommended establishing a framework for digitisation projects in the UK, and insisted the importance of users' needs to be further investigated. User studies of historians were reviewed to complete the rationale for the current study. Questions of the study, aims and objectives were similarly explained, and chapters were also outlined.

Chapter 1: literature review

This chapter presents the theoretical perspectives about three main areas (IRS, information needs and seeking behaviour, and creativity) that are derived from the questions of this study. Understanding the mechanism of IRS and evaluation criteria serves the aim of enhancing IRS of digitised primary sources. In turn considering the information needs and seeking behaviour is another essential task that assists in identifying the areas that need to be improved in any IRS from the perspectives of users. Creativity is the third area that contributes to the originality of this study. Stimulating the creativity of historians by using IRS of digitised primary sources requires the theoretical understanding of creativity from the perspectives of both psychology and information systems (IS).

Part 1: Information Retrieval System

Introduction

The impact of IT has been very clear on our lives where global communication is considered to be a key element for organisations and people (Rainer and Cegielski, 2011). The life of individuals is affected in terms of living, education and work. Life becomes convenient, but also quicker and to succeed it is necessary to be up-to-date with information and technological developments. Especially, that information overload challenges not only individuals but the whole world in which the need for organising and managing this information becomes pressing. Information is the engine for various facets of modern life and it should be processed in such a way that facilitates its retrieval effectively whenever a need occurs. This is exactly the primary task for IRSs that find the information that is relevant to users' information needs and queries.

This chapter introduces the theoretical perspectives of IRSs; their basics, mechanism, models, and evaluation. Success of IRS is also concerned by reviewing the IS success model because an ideal IRS is not only about retrieving relevant sources, yet this includes other factors such as quality of system, services and information.

Basics of information systems

Generally, IS refers to the activities of collecting, processing, and storing data to facilitate its retrieval (Mishra and Mohanty, 2007). In the fields of libraries and information science it is called IRS, and it facilitates the retrieval of documents instead of data (Swanson, 2012). IS is as old as humans realised the need to organise their information to assist the easy retrieval; starting from a cabinet of files to reach a computer-based IS for either the individual or organisational purpose. Typically an IS consists of inputs or sources, processing or manipulating sources, and the outputs or the services that users receive (figure 2):

```
┌──────────┐      ┌──────────┐      ┌──────────┐
│  INPUT   │ ───▶ │ PROCESS  │ ───▶ │  OUTPUT  │
└──────────┘      └──────────┘      └──────────┘
```
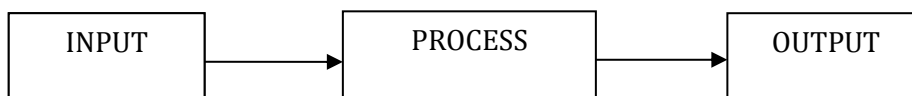
Figure 2: Model of a simple system (Mishra and Mohanty, 2007:26)

Using computer technologies in IS has widely opened the door for many advanced applications that support organisations in their operational processes to better serve users. Providing better services and timely information in less cost are the main aspects for competition generally in economic and particularly in the industry of information. In a computer-based IS, computer performs most of the processes and it consists of:

- *Hardware*: the devices that help input, process and display data such as keyboard, processor, monitor and printer;
- *Software*: the programmes that help hardware to process the data.
- *Database*: the collections of data;
- *Network*: the connecting system between many computers that allow them to share information;
- *Procedures*: the instructions on how these components can work together in order to process information;
- *People*: who works with hardware and software; along with the users who receive the output. (Rainer and Cegielski, 2011: 40).

Using computer makes IS faster and easier in retrieving information; further to its capability in storing huge amounts of information. ISs constantly entail development to ensure meeting users' requirements. Regarding the view where technologies change rapidly and information increasingly floods, users become more demanding in terms of accuracy and accessing timely information, especially that they have good knowledge about the quality of services offered in the digital environment. In Archives, situation is not very different from that general view; where historians have a legible desire to have more online sources that are well processed and introduced. Archives are not profit organisations and to some extent competition is not that important to them, yet the vital thing is the satisfaction of historians.

Information retrieval systems

The notion of Information retrieval goes back in time to a very ancient period when mankind acquired and developed their writing where the earlier scheme of information retrieval was presented by ancient archives and libraries such as the Sumerian archives or the library of Alexandria (Larson, 2012). Information retrieval as a term was first coined in 1952, while 1958 is said to be the start of information retrieval as it is known today (Jones and Willett, 1997a). Currently, with the huge explosion of information; the mission of information retrieval becomes challenging in terms of storing, organising and retrieving this continuous production of information. The task of information retrieval is responding to users' queries by selecting relevant sources or information (Strzalkowski, 1997). Nevertheless, the critical aspect of information retrieval pertains to select only the information that is relevant to users' queries or needs. This is a complex task because it does not only include the technical aspects that enable system to select information; rather it pertains to the psychological and behavioural side of users in which understanding the term *relevant* from the view point of users is essential (Larson, 2012).

Goker and Davies (2009: xxi) defined information retrieval as "the process of matching the query against the information objects that are indexed"; likewise Larson (2012), who identified two functions of information retrieval: *indexing* and *retrieval*. Chowdhury (1999) identified two main functions of IRS: a) analysing the contents of sources and users' queries,

and b) matching sources to queries in order to retrieve the relevant information. The functions defined by Chowdhury (1999) simply indicate the processes of indexing sources and retrieving them to match users' needs.

Indexing

Indexing involves extracting standard information (index terms) from inserted sources in order to store this information in the system to be matched with users' queries (Larson, 2012). Indexing refers to the activities of describing the content of sources using index terms (Lancaster, 1998; Guinchat and Menou, 1983). In terms of information retrieval, indexing serves three essential purposes:

- Finding sources by subject (classification);
- Structuring relationships between sources and subjects; and
- Predicting relevance between users' information needs and stored sources (Korfhage, 1997).

Indexing is approached through two stages: subject analysis and subject index. Subject analysis or classification is performed first to decide the essence of a source or what it is about, and then this conceptual analysis is converted into a list of index terms that are connected together by a set of semantic relationships (Lancaster, 1998; Chowdhury, 1999). Index term is a noun that can be generated manually or automatically, extracted from the natural language of a source or assigned from another source adopted by the IRS or institution such as controlled vocabularies (Lancaster, 1998; Kowalski, 1997; Korfhage, 1997).

Using natural language in manual indexing promotes the flexibility of indexer in describing the contents of sources, though this also causes inconsistency especially when several indexers are working together to describe a large collection; adding that manual indexing is time consuming (Korfhage, 1997; Kowalski, 1997; Chowdhury, 1999). Using controlled vocabularies in indexing reduces the accuracy of source's description (Cousins, 1992), yet it

cultivates the probability of using the same term by indexer (describing sources) and user (formulating search query) (Korfhage, 1997), which positively influences the matching processes. In turn, Cousins (1992) argued the opposite when she suggested the use of natural language in indexing to enhance information retrieval.

Automatic indexing is performed by system and based either on a full text index, in which every word in the source can be assigned as an index term, or on algorithms that calculate the term's weight depending on its frequency of occurrence in a source (such as in the vector model explained in the next section) or on its probability of relevance (probabilistic model) (Korfhage, 1997; Kowalski, 1997). Unlike the manual indexing, automatic indexing is quick and maintains consistency; however, automatic indexes can be generated only from sources with searchable texts.

The effectiveness of indexing systems is evaluated by two measures: exhaustivity and specificity (Chowdhury, 1999). Exhaustivity indicates the breadth of coverage or the degree that the source's subject is represented by index entries, while specificity indicates the depth of coverage when selecting an index term (Korfhage, 1997; Lancaster, 1998). Chowdhury (1999) and Lancaster (1998) discussed the relationship between index exhaustivity and specificity in one hand, and recall and precision (discussed in a later section) of retrieval in another; showing that very exhaustive index causes the decline of precision, while it supports high recall. Similarly, emphasising the specificity of an index enhances precision, though this negatively impacts the recall of results.

Apparently, consistency and accuracy of indexing are essential factors in representing the sources stored in IRS to better match users' queries and accordingly satisfy their information needs.

Retrieval

The retrieval functions involve receiving research query from users and transferring this query into a form that can be similar to indexing terms to allow comparison with terms abstracted from sources (Larson, 2012). Matching users' query with index terms results in retrieving a set of sources that were found to be relevant to the information needs of users expressed in search queries (figure 3). IRSs vary in the methods of generating this ranked list of relevant sources, and are referred to, in the literature, as information retrieval models.

According to Hiemstra (2009) (figure 3), the mechanism of IRS focuses on three fundamental processes: representation of sources by the means of indexing, representation of users' query, and the comparison process that matches between user query and indexed sources in which relevant sources are retrieved and ranked in a list.
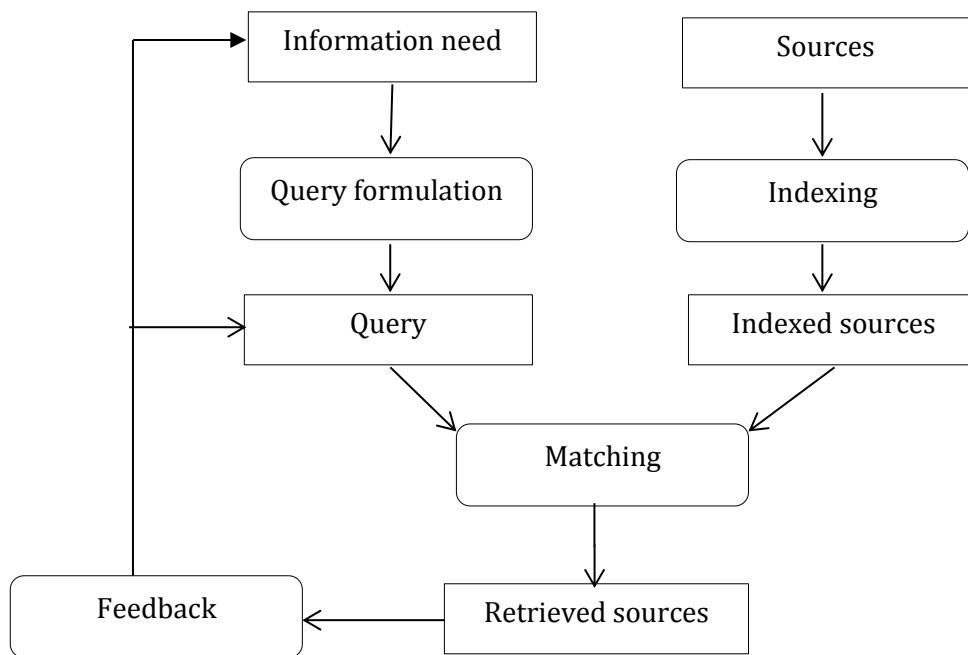
Figure 3: Process of information retrieval (Hiemstra, 2009: 2)

Based on users' evaluation of retrieved sources; amendments are applied to search query and/or information need. For instance; if user considered retrieved sources to be irrelevant, then search query needs to be reformulated using maybe other terms.

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Information retrieval models

Models of information retrieval refer to the methods that an IRS adopts in matching a search query with indexed sources to retrieve a list of relevant sources (Larson, 2012; Jones and Willett, 1997b). Essentially, information retrieval models do not indicate only the retrieval mechanism, but also the way of formulating a search query (Jones and Willett, 1997b). Models of information retrieval are essential in guiding research as well as the implementation of IRS (Hiemstra, 2009). Information retrieval models are grouped into three classical models: Boolean, Vector, and Probabilistic.

Boolean Model

Boolean model is one of the earliest and fundamental models of information retrieval that provides an exact match, but not ranked results (Larson, 2012; Hiemstra, 2009). This model is based on the Boolean logic that allows user to join two or more concepts to define the information needs in one search query (Kowalski, 1997; Haynes, 2004); by the means of Boolean operators (figure 4):

- AND: indicates that both terms are required to be in the results;
- OR: indicates that one of the terms is required to include in the results;
- NOT: indicates the term that should not be presented in the results.
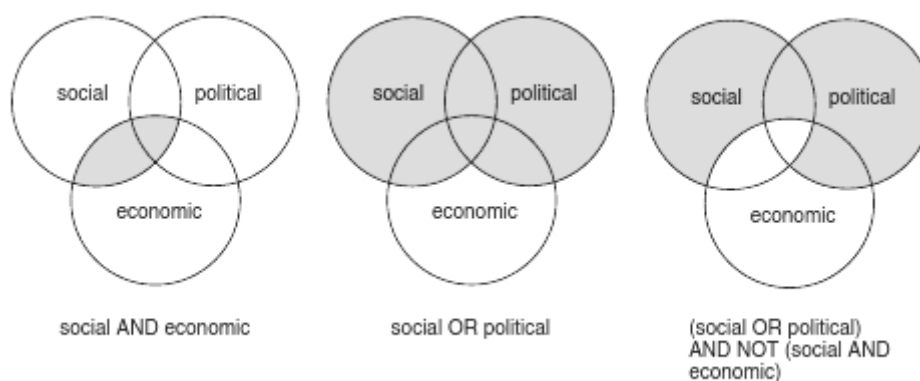
Figure 4: Combination of Boolean operators (Hiemstra, 2009: 4)

According to the Boolean model, a source is either relevant or not relevant; there is no other option, and index terms are existed in a source or not, so the weight of an index term is presented in a binary (Baeza-Yates and Ribeiro-Neto, 1999):

$$w_{i,j} \in \{0, 1\}$$

Equation 1: the binary weight in Boolean Model. For which: k_i is an index term, d_j is a source, $w_{i,j}$ is weight associated with (k_i, d_j), 0 refers index is not existed, 1 refers index is existed.

Boolean model is clear and simple (Baeza-Yates and Ribeiro-Neto, 1999), and enables users to have some kind of control over the IRS (Hiemstra, 2009); nevertheless it does not allow the ranking of retrieved sources, and requires both user and system to use the same terms for the match to be successful, adding that users need training on how to form a search query using the Boolean operators (Larson, 2012; Chowdhury, 1999; Jones and Willett, 1997b; Cooper, 1997).

Vector model

Vector model ranks the retrieved sources according to the similarities detected between query and indexes where the sources that appear most relevant come first in the list. Unlike the Boolean model that uses binary weight, Vector model allows partial match, and term weight predicts the degree of similarity or relevance between each source in the IRS and a query (Baeza-Yates and Ribeiro-Neto, 1999; Jones and Willett, 1997b). In the vector model sources and queries are seen as vectors in a dimensional space in which sources that have similar indexes appear close to each other in a given space (Salton et al, 1975). Index term is weighted in both of the sources and query for that the vector query and vector source are computed for the times that an index occurs in a system:

$$\vec{q} = (w_{1,q}, \ w_{2,q}, \dots, w_{t,q})$$

Equation 2: Vector query in Vector model. For which t is the total calculation of index term of query in a system.

In Vector model, similarity is measured by the *inner product* that refers to the correlation between source and query (Larson, 2012; Hiemstra, 2009). Another measure of similarity is the *cosine of the angle* between the vectors of source and query (Baeza-Yates and Ribeiro-Neto, 1999).

Vector model has several advantdages in which it improves the information retrieval by using the term-weight scheme, allowing the partial match, and cosine rank (Baeza-Yates and Ribeiro-Neto, 1999). However, Hiemstra (2009) mentioned a problem in the implementation of this model where the computation of cosine measure requires the values of vector components that are not originally defined in this model.

Probabilistic model

Regarding a user query, in the IRS there are a set of sources that contain relevant information, while others do not. The *source retrieval problem* is to retrieve all the relevant sources that user needs, and to dismiss the irrelevant sources (Robertson et al, 1982). Regarding the fact that relevance is subjectively measured by users, there are no defined relationships between index and the relevance of source, which makes the prediction of relevant source difficult (Larson, 2012). Robertson et al (1982) defined relevance as the relationship between source and user, and they described this relationship as complex because user may look for information for a very definite or vague reason, or user may do not know what information would satisfy his/her need. In this view, designing an IRS that "retrieves all and only the relevant source" is not ideally achieved because relevance cannot always be well predicted (Robertson et al, 1982). For this, computing the probability of relevance for each source in the system contributes to the source retrieval problem by ranking the retrieved sources in a descend order of their probabilistic relevance to a user query (Larson, 2012; Chowdhury, 1999; Robertson et al, 1982).

Robertson et al (1982) presented a unified theory of computing probability of relevance that consists of four models: Model 1 that measures the relationship between submitted queries

and a certain source. Model 2 measures the relationship between a set of sources and a certain user. Lower-level model 0 measures the relationship between group of sources and group of users, and higher-level model 3 that again measures the relationship between individual user and individual source. Feedbacks from users are considered of a great importance in enhancing the probabilistic retrieval.

Classical models of information retrieval are perceived to not perfectly support the information retrieval in which the Boolean model does not rank results. Vector model has a problem in implementation, while probabilistic model does not count the index frequency inside a source (Hiemstra, 2009). These limitations triggered researchers to develop these models in more effective ways in which currently there are plenty of alternative models as the extended Boolean model, fuzzy model, generalised vector space model, and Bayesian network.

Evaluation of retrieval performance

Performance of information retrieval is usually evaluated in terms of response time and used space (Baeza-Yates and Ribeiro-Neto, 1999). However, there are another two common measures in evaluating performance in IRS: recall and precision (Kowalski, 1997; Baeza-Yates and Ribeiro-Neto, 1999; Large et al, 1999; Salton and Buckley, 1988; Haynes, 2004; Mandl, 2008). IRS is evaluated against its ideal task that Robertson et al (1982) referred to as "retrieving all and only the relevant sources" for which recall refers to the system's ability of finding all relevant sources, while precision refers to how accurate the system is in retrieving only the relevant sources. In abstract, recall is about retrieving relevant or useful information, where precision is about avoiding useless information (Lancaster, 1998, Chowdhury, 1999). According to Large et al (1999) recall measures the effectiveness of retrieval, whereas precision measures the accuracy of retrieval.

Recall is measured by the fraction of relevant sources retrieved from the entire relevant sources in the system, while precision is measured by the fraction of relevant sources

retrieved from the totality of retrieved sources (Salton and Buckley, 1988; Baeza-Yates and Ribeiro-Neto, 1999; Large et al, 1999; Haynes, 2004; Mandl 2008):

$$Recall = \frac{Number\ of\ relevant\ documents\ retrieved}{Total\ number\ of\ relevant\ docuemnts}$$

$$Precision = \frac{Number\ of\ relenavt\ documents\ retrieved}{Total\ number\ of\ retrieved\ documents}$$

Practically measuring recall and precision is not an easy task, especially on internet or in large databases due to the difficulty of knowing the total number of relevant sources, adding the difficulty of measuring the relevance of retrieved sources (Haynes, 2004, large et al, 1999, Chowdhury, 1999; Kowalski, 1997; Korfhage, 1997). Further to this, Large et al (1999) questioned the validity of recall as a measure when users are not concerning the exhaustivity of research. Similarly, Korfhage (1997) stated that it is not clear whether recall and precision are both important to users.

Inverse relationship between recall and precision has been mentioned plenty of times (Buckland and Gey, 1994; Chowdhury, 1999; Large et al, 1999; Haynes, 2004) in which seeking high recall results in low precision, and the opposite is correct. Buckland and Gey (1994) pointed out that the trade-off between recall and precision cannot be avoided, yet they can be enhanced by approaching two stages in retrieving information; in which the first one concerns high recall, while the second stage concerns high precision.

Seemingly, the functionality of IRS focuses on source retrieval problem, which means retrieving the information that is relevant to the information needs of users and match their queries. In reality, this often seems unsuccessfully achieved because relevance is measured from a user's point of view, which is always subjective. "Perfect retrieval systems do not exist

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and will not exist" due to the incomplete statement of research; adding that relevance of information is judged from a subjective point of view (Hiemstra, 2009; 1) to which matching user's query with relevant information is not always successful. Belkin et al (1982a) considered the best match principle of information retrieval as a central weakness; because this principle is based on the assumption that the information needs of user, formulated in a search query, is equivalent to the index terms that describe sources, which is not always applicable, especially that users are often unable to express their information needs precisely.

The major problem of IRS is that it requires users to specifically identify what system should retrieve, especially that users do not know what vocabularies the system uses in indexing sources, or even how the system operates in retrieving sources (Belkin, 2000). From this view, Belkin et al (1982a, b) proposed the design for ASK the IRS that deals with anomalous information needs. Interacting between information retrieval and users is greatly considered in ASK in which user's feedback or evaluation is used to modify user's problem statement and/or retrieval strategy. Similarly, Salton and Buckley (1988) assessed the importance of relevance feedback in improving retrieval performance whereby a query is reformulated in the light of evaluating relevance of previous retrieval. Nevertheless retrieving only relevant documents or information is an essential measure of IRS, in turn there are still other criteria that decide how successful and effective this system is.

IS success

Trillion dollar has been annually spent on IT last century (Seddon et al, 1999); however, this spend beats the expectations in 2013 where the total spend will exceed $3.6 trillion (Gartner, 2013). Investing vast amounts of human and financial sources in IT; stressed the effectiveness of IS by organisations and researches alike. In the literature there is plenty of works that concern the effectiveness of IS either by approaching theoretical or empirical studies.

Of the theoretical works, Hamilton and Chervany (1981) defined system effectiveness from the views of goal-centred and system-source; where effectiveness is firstly determined by

achieved gaols; and secondly by a good practice. DeLone and Mclean (1992, 2003) designed and developed a model for IS success based on theoretical analysis of IS literature during 1980s and 1990s. Seddon et al (1999) carried on a theoretical review of empirical studies of IS effectiveness to propose a two-dimensional matrix where they classified the measurement of IS effectiveness in two dimensions: system and stakeholder. Sedera and Gable (2004) developed an enterprise system success model where four success dimensions were proposed, tested and validated; approaching a survey method on three stages. Smolnik and Riempp (2009) approached a theoretical review of IS success between 2003 and 2007 to explore the current estate of IS success measurement.

Regarding the empirical works, Ives et al (1983) suggested developing a standard tool to measure user information satisfaction after testing and comparing several instruments that were previously used. Likewise, Roy and Bouchard (1999) reviewed theories and methods of measuring user satisfaction accompanied by a case study to ultimately propose a method to develop existing instruments according to the context of IS. Doll et al (2004) designed an instrument to measure user satisfaction of IS based on a survey method. In the same way, Ong et al (2009) produced their instrument.

Gable et al (2008) introduced a conceptual model of IS's impacts using survey and content analysis methods. They categorised benefits in two levels: current level to affect organisations and individuals, and anticipated level to affect the quality of information and system. Later on, Gorla et al (2010) studied the influence of system quality, information quality and service quality on organisational impact using a survey method in which service quality revealed the biggest impact on organisation. Doll and Torkzade (1998) measured the use of IS in organisations, using survey and interview methods, regarding the ways of using systems in management processes and customer service.

Based on this review, the IS Success Model of DeLone and Mclean (1992, 2003) is considered in greater details as a standard framework to measure the effectiveness of IS; primarily

because it is the number one citation in the literature of IS (Urbach et al, 2009; Lowry et al, 2007). Adding that generating this model was based on a comprehensive method of analysing literature of IS for more than 7 years starting from 1981, and it has been updated by the original authors after 10 years. Furthermore, the success dimensions of DeLone and McLean's model are frequently used in the literature of IS as criteria for measuring IS success.

IS success model

DeLone and McLean (1992) defined six interrelated categories to measure the success of IS: system quality, information quality, use, user satisfaction, individual impact, and organisational impact. This model concerns the major components of IS starting with input (information) and system to end with users and their feedback, and how this feedback reflects ultimately on the overall performance of organisation. System quality reflects the level of "technical success", and information quality reflects the "semantic success", while the other factors reflects the "effectiveness success" of services (DeLone and McLean, 2003).

Essentially, this model exceeded the expectations of its developers and it was increasingly cited in the literature. Accordingly, after 10 years, DeLone and McLean updated their model to introduce a more comprehensive one. Especially that IS has been rapidly developed since 1980s, where the research first led to introducing the original model, and the need to produce an update framework was required. Seddon (1997) also was interested in extending the model of DeLone and McLean where he argued that system use has further consequences on individual, organisation and society, which are not indicated by DeLone and McLean. Thus, measuring net benefits and usefulness is seen to feed user satisfaction that in turn reflects on the future use of system.

The updated model was based on a theoretical review of 100 articles since 1993. DeLone and McLean added service quality, the intention to use, while net benefits was added as a replacement for both individual and organisational impacts. DeLone and McLean agreed with Seddon (1997) in terms of having multidimensional aspects of system use and also in using

net benefits instead of impact. Pitt et al (1995) argued that measuring IS success is not comprehensive if service quality is not included. Accordingly, DeLone and McLean considered this issue in their update. The updated model consists of six measuring dimensions: information quality, system quality, service quality, intention to use/use, user satisfaction, and net benefits (Figure 5).
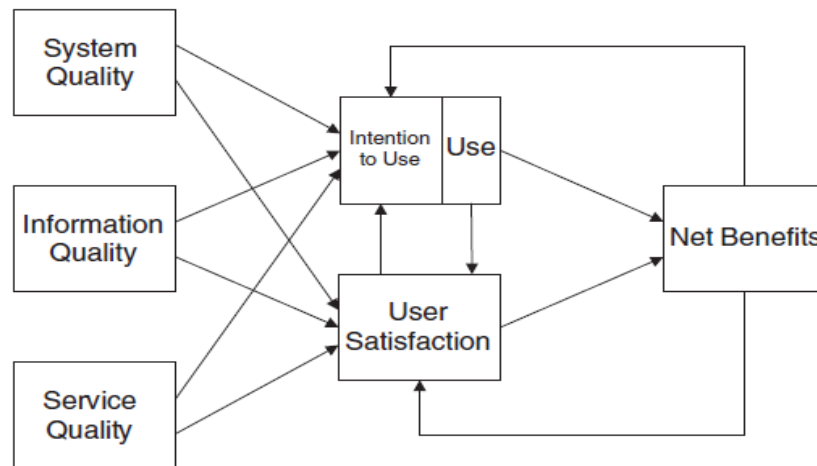
Figure 5: The updated model of IS success (DeLone and McLean, 2003)

Clearly DeLone and McLean associated more interrelationships between the success dimensions in this update model; where quality of system, information and services similarly affect both system use/intention to use and user satisfaction. A mutual relationship exists between system use and user satisfaction. Using system impacts the user satisfaction either positively or negatively to affect the user's future behaviour towards the system by reusing it or not. In turn, system usage and user satisfaction influence the net benefits of users and organisation. Ultimately the net benefits impact the intention to use and user satisfaction.

These interrelationships between success dimensions entail that the success of IS depends on the effectiveness of the entire components of a system; unless the IS context suggests to pay more attention to one component over the others. Following, the six success dimensions of IS are reviewed in details for a comprehensive understanding of what causes IS to succeed.

System quality

As a success measure, system quality refers to the standard attributes that are desired to achieve in IS in terms of performance and usability. In an early study, Davis et al (1989) stated that users' acceptance and use of computers largely depend on usefulness and ease of use. Rivard et al (1997) designed and validated a three-layer instrument to measure system quality; identifying eight main categories: reliability, portability, user friendliness, understandability, effectiveness, maintainability, economy and verifiability.

In the same way, DeLone and McLean (2003) in their success matrix identified five characters "adaptability, availability, reliability, response time and usability" to measure system quality. Sedera and Gable (2004) developed an instrument, as part of their enterprise system success model, to measure system quality concerning nine features namely: "ease of use, ease of learning, user requirements, system features, system accuracy, flexibility, sophistication, integration and customisation". Nelson et al (2005) also identified five dimensions to measure system quality "reliability, flexibility, accessibility, response time, and integration".

Attributes of system quality can be classified in two groups: one is related to the technical side of designing a system with useful features, while the other is related to end users, which entails an easy to use system (Gorla et al, 2010). Noticeably, friendly system that is easy to use and navigate through is a very common factor to measure system quality. Indeed, users like to retrieve information in a convenient and easy way. Complex systems seem to be designed for experts, not for users who usually have different level of experiences in dealing with IRS.

Information quality

Information quality refers the outputs of a system and what users desire the received information to be. For example; users of IS want the information that is timely accurate and relevant to them. Apart from timely and relevant information, there are many other standards to assess the information quality such as; "consistency, precision, reliability and usefulness"

(Urbach and Müller, 2012: 6). In turn, DeLone and McLean (2003) identified five more characters that are essential in assessing the quality of information "competence, ease of understanding, personalisation, relevance and security". Sedera and Gable (2004) identified six factors to measure information quality namely: availability, usability, understandability, relevance, format and conciseness. While, Nelson et al (2005) identified other four dimensions "completeness, accuracy, format and currency".

In terms of IRS, in the first place users want relevant information that satisfies their information needs and answer queries. However, the critical issue, as discussed earlier, is associated with the term relevance and how users evaluate retrieved information.

Service quality

Service quality refers the "overall support delivered by the service provider" (DeLone and McLean, 2003). Usually, users of IS judge service quality, and this judge is based on the difference between what they should have and what they offered (Watson et al, 1998). Service quality can be assessed by SERVQUAL instrument that consists of five dimensions: "reliability, assurance, tangibles, empathy, and responsiveness" (Parasuraman et al 1993; Buttle, 1996; Landrum et al, 2009). SERVQUAL was first introduced by Parasuraman et al (1988) to assess service quality in retailing organisations, while Pitt et al (1995) concluded the validity of SERVQUAL to be applied in IS.

Later, Landrum et al (2009) used SERVQUAL to measure service quality in IS of a library and they recommended reliability and responsiveness to be more emphasised by IS managers and designers. Urbach and Müller (2012: 6), in their theoretical review, identified some more measuring dimensions like "flexibility, interpersonal quality, intrinsic quality and IS training".

Measuring service quality is vital to achieve the equation between user expectations, and system's functions and services in which user expectations can be derived from their needs and past experience (Zeithaml, et al, 1990). Furthermore, measuring service quality requires

communication channels (Watson et al, 1998) between users and system administrators to benefit from users' feedbacks. Watson et al (1998) recommended service quality to be integrated in the management process of IS to cultivate the regular assess of service quality not only on certain occasions.

Intention to Use/Use

Measuring the system usage can be assessed by different issues that can indicate the actual usage of a system for example; the number of visits, the functions that are most used or the number of downloaded files. However, it is important to differentiate between the accident visits and the intended visits. Doll and Torkzadeh (1998) argued that it is essential to consider the way of using a system not only the duration and frequency of use, thus they measured the use of system in organisations in terms of using this system to support decision making, solve problem and serve customers.

Obviously, the intention to use a system depends to a large extent on user's experiences and attitudes when using and navigating through the system. Technology acceptance model (Davis, 1986) is a well-respected model that explains the effect of system on user. Essentially, attitude toward using a system is formed by perceived usefulness and ease of use, and this attitude determines the decision of intentional use that ultimately shifts into behaviour, which is the actual use. Davis et al (1989) carried on their interest in reasoning user's behaviour of either accepting or rejecting the use of computers by comparing two theoretical models. Interestingly, they found usefulness and ease of use to be key drivers for intentional use. Indeed, since system is easy to use and offered helpful information, there is nothing can prevent user from using this system in future or recommending it to others.

User satisfaction

Users' satisfaction is a very important success dimension because satisfying users is the ultimate target for any system either in profit or non-profit organisations. Moreover, user satisfaction mirrors the success and usefulness of provided services, which in turn impacts

the overall performance of organisation. From this view, Saarinen (1996) and Gelderman (1998) argued that user satisfaction can be considered as alternative measure for IS success, while Thong and Yap (1996) and Griffiths et al (2007) said that it is subjective and cannot be the only indicator of IS success because there are other success factors pertaining to organisation and system design.

Bailey and Pearson (1983) defined user satisfaction as the "positive or negative reactions to set of factors". Accordingly they identified 39 factors that affect user satisfaction; in which accuracy, reliability, timeliness, relevancy and confidence in system where rated first in importance. Ives et al (1983) developed a 39 scale instrument to measure user information satisfaction, and also Doll et al (2004) developed an instrument to measure the *End-User Computer Satisfaction* that involves five main categories "information content, format, accuracy, ease of use, and timeliness", which in turn goes into 12 subcategories to intensively test the satisfaction of users. Similarly, Ong et al (2009) proposed an instrument to measure *User Satisfaction with Question Answering System;* consisting of two levels: the first level includes four key categories "ease of use, usefulness, service quality and information quality", while the second level consists of 18 subcategories of questions. Urbach and Müller (2012:8) identified some more elements to measure user satisfaction "adequacy, effectiveness, efficiency, enjoyment, information and system satisfaction and overall satisfaction". Griffiths et al (2007) argued in their theoretical review that ease of use and perceived usefulness affect user satisfaction more than the overall performance of a system. Measuring users' satisfaction in IS may vary from context to another; however, easy to use system and useful information seem the basic requirements that users want.

Net benefits

This dimension of IS success refers to the overall outcomes that contribute to the success of users and organisation alike. Net benefits as understood from DeLone and McLean (2003) are much more related to e-commerce than cultural or non-profit institutions where they identified "cost saving, expanded markets, additional sales, reduced search cost, and time savings" as elements to assess net benefits. The first three elements seem to be related to

organisations, while the last two elements pertain to users or customers. Furthermore, Seddon (1997) defined anther third impact which is on society. The first two impacts were included in the original model of IS success produced by DeLone and McLean (1992), but replaced with net benefits in the updated model.

Gable et al (2008) developed a model to measure the IS impact on individual and organisation. This model consists of two levels: one is the current "impact", while another is "quality" referring to the anticipated impact of IS. The individual impact refers to the influence that IS makes on individual's performance (Gable et al, 2008) and it can be perceived on both of employees and users of IS. Urbach and Müller (2012) identified 11 elements to measure the individual impact as; productivity, usefulness, task innovation, job simplification and others. Wang and Chen (2011) concluded user satisfaction as a significant indicator of individual impact or net benefit. Organisational impact refers to the benefits acquired because of applying IT, which can be measured in terms of management and business process, competitive advantage, cost reduction and increasing productivity (Urbach and Müller, 2012). Gorla et al (2010) found that organisational impact is significantly affected by service quality and information quality.

Reflecting net benefits on cultural institutes such an archive; the perceived benefits on users of IRS of digitised sources can be defined as: convenience, productivity, time and cost saving. Digitised sources enable historians to avoid travelling to remote archives by accessing sources online. Even though archives offer free or little charge services, they still benefit from IS of digitised sources by reducing the pressure on some services and sources that are most used. By this archivists can devote more time to work on processing and introducing online sources.

Accordingly, a successful IS entails offering a standard system with up-to-date software, friendly user, and error free performance that help organisations improving their work and satisfying customers. Considering complex system as more prone to be unsuccessful (Whyte

and Bytheway, 1996); indicates that success is not determined by using the latest IT, it is very much about satisfying users who want easy and effective way of finding information.

It is important to clarify that IS success model is not applied to this research. However, it did help in gaining a better understanding of what are the components of a successful IRS. This facilitates the identification of the areas that require more improvements. For example, historians in this study did not just concern the precision of results to their search query; also they insisted the importance of sources' availability and metadata accuracy, which are related to information quality. The same can be said regarding system quality where historians want IRS of digitised sources to be easy to use. The training issue that historians claimed is included in service quality (detailed explanations of these improvements are presented in part 3 of chapter 4 and in chapter 5).

Summary

Information overload has been challenging the task of IRSs in retrieving only the relevant information from a large amount of collections. Basics of IRSs, functionality, and models of information retrieval were discussed to clarify different methods of information retrieval. Evaluation of retrieval performance was also considered in terms of recall and precision. Success dimensions of IS (Model of DeLone and McLean) were covered in this review in the way it contributed to the overall understanding of what makes a successful IS. However, retrieving relevant information is not just about the mechanism of IRS, it also includes aspects related to users' cognitive behaviour and subjective evaluation of relevance. Therefore, information needs and seeking behaviour of users need to be well understood when designing or developing IRSs; to which the next section is devoted.

Part 2: Information Needs and Seeking Behaviour

Introduction

The previous section introduced information retrieval highlighting system's functionalities and retrieval models. However, this chapter emphasises the users of system regarding their information needs and seeking behaviour, because understanding these issues is required to better meet and satisfy users' needs of IRSs.

The interest in information studies in its broad domain can be tracked back to 1948 in the *Scientific Information conference of Royal Society*; where some papers related to scientists' information behaviour were presented (Wilson, 1994, 1999). Information studies expanded from the field of library to have its very own area. Information was firstly studied from a system point of view until the 1970s where the emphasis shifted towards user studies; especially information needs and uses (Case, 2002) to have over than one thousand research in information user studies and behaviour just by 1977 (Crawford, 1978). One of the essential developments in the field was establishing a *Centre for Research on User Studies* (CRUS) in 1975 in Sheffield University (Wilson-Davis, 1977; Siatri, 1999) to play a vital role in guiding user studies' research.

In 1981, Wilson defined the spectrum of information behaviour in an attempt to present the various areas that contribute to the general picture of information behaviour; outlining: information need, ISB, information use, information exchange, and information transfer. ISB has been a concern for scholarly studies in different fields and contexts to exceed 10,000 papers and research (Case, 2002). Significantly, a joint research project of *information seeking and mediated searching* (Spink et al, 2002a), supported by the National Science Foundation in the USA and the British Library in the UK, results in a series of articles that investigated uncertainty in information seeking (Wilson et al, 2002), *successive searching* (Spink et al, 2002b) and *cognitive styles in information seeking* (Ford et al, 2002). Such a collaborative effort of established scholars (Amanda Spink, Tom Wilson, Nigel Ford, Allen Foster, and David Ellis) contributes in enriching both theory and practice of research in information-seeking

and behaviour. However, increasing the interest in information studies that concern information needs, seeking, and use of individuals rather than systems comes as a rationale to satisfy systems' users. Understanding what is going on in the mind of users becomes a popular interest for researchers worldwide (Case, 2006).

Interestingly, several researchers have answered the question of: why to bother with information needs and seeking-behaviour? Where Wilson (1995) confirmed the importance of acquiring the appropriate knowledge about information needs and ISB before designing IS to ensure that this system can satisfy its users. Indeed, in order to successfully meet the information needs of users, information professionals are required to understand the situations that gave rise to these information needs (Nicholas, 2000). Developing IRS is based on knowing the information needs of users in which this knowledge can be gained by collecting information on three levels: firstly about organisation, then user group inside the organisation, and finally about individual users (Chowdhury, 1999). Modelling ISB of a system's potential or actual users informs the design or development (re-design) of this system (Makri, 2008). Understanding information needs and ISB of system's user is essential in the stage of gathering requirements for system design or even development.

Information Needs

In daily life, people come across many situations where they need to satisfy different types of needs (physiological, psychological, and cognitive). Often they cannot deal with an issue or perform a task because of not having enough information. This triggers the motivation to look for information that would be of help. In working a definition for information needs; it is most preferred to demonstrate the components of this term in which information is "stimulus that reduce uncertainty" and need is the "recognition of the existence of this uncertainty" in individuals' life (Krikelas, 1983: 6). Ford (1980: 100) defined information needs as "the awareness of a state of "not knowing" or some conceptual incongruity". In this view, information needs are seen as an "anomalous state of knowledge" (Belkin, 1980: 136), or recognition of inadequate knowledge (Case, 2002; Chowdhury, 1999). Information needs reveal an individual's lack of information that is essential to perform a job, resolve problem,

or satisfy an interest (Nicholas, 2000). It is possible to say that information needs indicate an instant failure in satisfying a task; mainly due to lack of information.

In the literature, studies of information needs have been approached into four contexts: seeking answers, reducing uncertainty, making sense, and as a motivation for information seeking (Case, 2002). Nicholas (2000) differentiated between information need, want and demand; in which not all wanted or demanded information is particularly needed; insisting the issue that need must be greater than demand. Studying information needs is believed to be a problematic subject (Wilson, 1981; Case, 2002; Chowdhury, 1999) because it involves cognitive processes that can be difficult to observe or define; especially when these cognitive processes are performed beyond the consciousness of individuals (Crawford, 1978). Information need is a relative concept; it changes according to person, situation and time (Chowdhury, 1999). Indeed, sometimes it is difficult to define or articulate our information need, which make it difficult to assess. This is in turn perceived to impact the work of information professionals in designing an IS that is supposed to meet users' needs that are sometimes unrecognised.

Nicholas (2000) pointed out that information professionals neglected the information needs of end users because they had a very high level of confidence that prevented them from consulting users, and their concern was to come up with the best system. This dereliction of duty in assessing users' information needs was due to not having sufficient communication skills, or tools to assess and understand users' needs (Nicholas, 2000). Even though, designing IS has currently reached an advanced level, the declaration that IS has offered users with what they need; is not completely accurate.

Nevertheless, there are so many reasons that force the assessment of information needs such as:

- The increasing cost of information projects and computer applications;

- Competing in the information market is a good reason to start concerning the information needs of users as this will influence users' satisfaction and in turn the profit of company;

- New generation of users who grown up in the digital age will continuously have multiple and different needs to be answered where information professionals would be challenged to meet these needs and develop their skills to compete in the marketplace (Nicholas, 2000).

Even though information needs of users are sometimes difficult to express, information professionals are still entitled to understand these information needs and how users seek information to satisfy their needs. Looking at information needs as a motivation to seek information; leads the talk to IRS where the next section is intended to address.

Information-seeking behaviour

ISB refers to the activities that people perform starting from a situation or a problem where a need emerges, going through various activities to satisfy this need. It is the journey of answering information needs. ISB is defined according to Krikelas (1983: 6) as "any activity of an individual that is undertaken to identify a message that satisfies a perceived need". Later on, Wilson (2000) defined it as "the purposive seeking for information as a consequence of a need to satisfy some goal". In the same context, Ford (2004) considered information seeking as a response to encountered problematic situation. These definitions stand on the concept that concerns an emerging need where all following activities are devoted to satisfy. As demonstrated previously, this need is caused by having inadequate information, which motivates individual to seek the information that would essentially change the state of knowledge. This brings to mind the fundamental equation of Brookes (1980):

$$K[S] + \Delta I = K[S + \Delta S]$$

In which knowledge structure $K[S]$ is transformed to a new structure $K[S + \Delta S]$ by the affect ΔS of information ΔI (Brookes, 1980: 131). If it was possible to say that $K[S]$ is the state of knowledge when recognising a problem or information need, then $K[S + \Delta S]$ would be the state of knowledge after solving the problem or satisfying the information need regardless of the fact that information seeking does not always end with a good result.

Information behaviour models are classified by Niedźwiedzka (2003) in two groups: firstly, regarding the background perspective of characteristics or processes of models such as:

- Cognitive models: that involve the intellectual processes of information seeking as in the sense-making model (Dervin, 1983);

- Social models: where social situations of users play the main role in deciding their information behaviour;

- Socio-cognitive: where social context affects the personal knowledge as in Wilson's model (1996);

- Organisational model: in which organisation's nature and user's professional occupation influence his/her information behaviour.

Secondly, according to the size of the behavioural picture; whether the model of ISB presents the whole activities, starting from an emerged need; going through the various activities to satisfy this need such as in Wilson's models (1981, 1996), or digs deep in one specific process such as in Ellis' model (1989) where the concern was on the process of searching for information.

Marchionini (1995) considered information seeking as a fundamental process that pertains to learning and problem solving, and further he identified several factors that are essential to information seeking:

- *Information seeker* who defines a problem or need in a certain domain, controls the interaction with search system, and determines the end of the process;

- *Task* (problem or need);

- *Search system* that provides information;

- *Domain* is an area of knowledge where a problem or need is identified;

- *Setting* that defines the search process; and

- *Search outcome* is the results of information seeking that satisfy a need, solve a problem or not.

The interaction between these factors is essential to perform the information seeking that occurs through a number of stages or processes where many studies were devoted to understand and model these processes as presented in next section.

Models of ISB

Information seeking attracts scholars from various disciplines because everything humans do can be a potential subject for information seeking (Case, 2002). Noticeably, the literature is rich in studies that produced different types of ISB. Some studies concerned certain process (Ellis, 1987; Kuhlthau, 1991), while others developed more general models (Marchionini, 1995; Wilson, 1996; Godbold, 2006; Niedźwiedzka, 2003; Foster, 2005). Further studies concerned the intellectual process of information seeking to make sense (Dervin, 1983) or solve problem (Wilson, 1999). In this review, several models of ISB are presented, to ultimately focus on the models that concerned the ISB of historians.

Wilson's models

In 1981 Wilson proposed one of the earliest models of ISB. It is a macro-model where information seeking is triggered by different needs of an individual; mainly information needs. These needs arise through the interactions between individuals and their context or environment. Different kinds of barriers can affect the ISB where Ellis' characteristics of information-seeking were adopted in a later version of this model (Wilson, 1999). Wilson's model focused on the motivational factors that cause needs to arise and on barriers that may constrain ISB. This model was not detailed enough to show the implicit hypothesises, which stimulated Wilson to develop another model (figure 6).
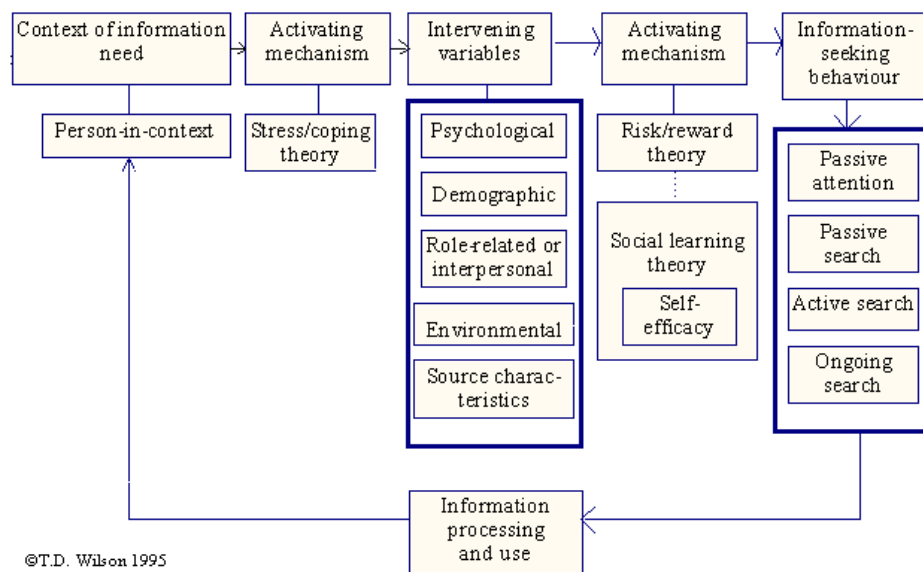
Figure 6: Wilson's 1996 model of ISB (Wilson, 1999: 260)

Wilson's 1996 model showed a variety of relationships with other fields such as "decision-making, psychology, innovation, health communication, and consumer research" (Wilson, 1999:260), and indicated different types of searches (passive, active and ongoing). This model presents ISB in its comprehensive view; presenting multiple factors to influence ISB. .

Sense-making model

Sense-making is not just a model of ISB; it is a set of concepts and methods approached to know how people make sense of their situation in terms of constructing the information need and using information (Dervin, 1983). Sense-making is considered to be remarkable in the information user domain, by which "cognitive discomfort" motivates information seeking (Niedźwiedzka, 2003), adding that it results in detailed knowledge about how individuals deal with problems or difficult situations (Case, 2002). Sense-making was firstly developed to communicatively study users' information needs, seeking and use (Dervin, 1999); it provides a framework to design the system that meets users' needs by communicating with them (Dervin, 1998). Sense-making model has three dimensions:

-   *Situation*: time space context where sense is constructed;
-   *Gap*: information need or need for a bridge; and

- *Uses*: constructing information in a way that helps or not, or outcome (Dervin, 1983: 9).

Sense-making is based on the concept of seeking information when realising a gap to construct a bridge over this gap between two points in time space. In this approach, using information is not always useful as in other information-seeking models (Dervin, 1999); outcome sometimes can be negative. Essentially, this assists system design by putting in mind all the possible outcomes of using information.

Krikelas' model 1983

Krikelas' model (1983) likewise other models, is a need-centred model where the process starts when recognising inadequate information or uncertainty regarding a problem or task (Figure 7).
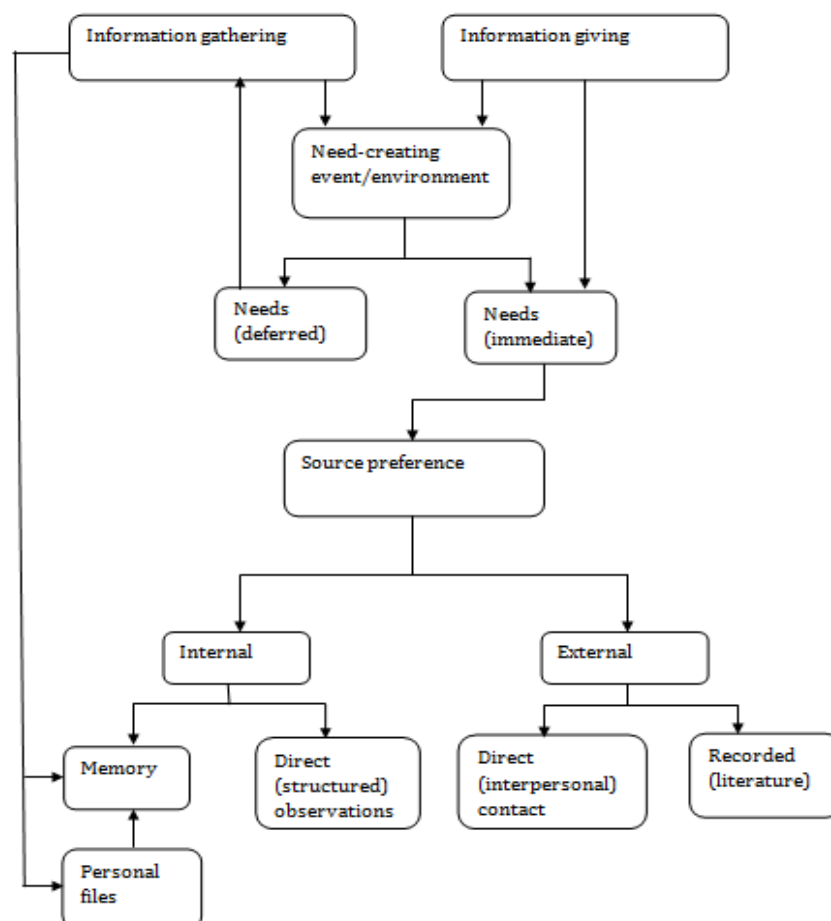
Figure 7: Krikelas' model of ISB (Krikelas, 1983)

In this model not all needs proceed information seeking; only the ones that are seen to be urgent. Response to urgent need is performed immediately by selecting the preferred type of sources that would satisfy the information need, while trivial need is deferred and considered as a type of information gathering to be stored in one's memory or file. Information sources are either internal or external. Internal is where sought information is existed in the seeker's memory or can be obtained by observation, while external sources involve literature and/or contacting other individuals.

Krikelas' model is a linear and non-complex model that can be applied to ordinary life tasks and situations. External factors that interact or impact the ISB are presented poorly unlike Wilson's model. Case (2002) questioned the way of separating information giving from information sources. Indeed, information giving is shown to impact immediate needs that could be related to serious issues or work tasks.

Ellis' model

David Ellis in 1987 identified six behavioural characteristics of information seeking to give an aid in designing IRS for academic social scientists. These characteristics are:

- *Starting*: this embryonic stage can be conducted throughout different ways such as starter reference, annual reviews, and bibliographies;

- Chaining: in which chasing citations and references of other articles can be performed either forward or backward;

- *Browsing*: by scanning and searching the contents of relevant journals or books;

- *Differentiating*: where decision is made about which sources are relevant, useful and worth looking at;

- *Monitoring*: is an attempt to be up-to-date by keep an eye on relevant journals or books' new publishes or being alerted instead;

- *Extracting*: requires a high level of focus when selecting material from a particular source (Ellis, 1987, 1989).

Later on, Ellis, in a research detected to model the information-seeking patterns of academic researchers, added two further patterns of the behavioural model which are:

- *Verifying*: testing out information whether it is correct or not;
- *Ending*: information in this stage would be presented and shared with others (Ellis, 1993).

Features in this model do not necessarily occur in consequence, rather "interaction of the features in any individual information-seeking pattern will depend on the unique circumstances of the information-seeking activities of the person concerned at that particular point in time" (Ellis, 1989: 178). Ellis in his behavioural model concerned only the process of doing search unlike the model of Wilson (1996) that provided a more comprehensive picture of ISB. According to Meho and Tibbo (2003), the importance of Ellis' model comes from being derived from an empirical study, and many other studies were based on this model, adding that most of the features that informed the design of IRS are now widely available.

Kuhlthau's model

Like Ellis (1989), Kuhlthau (1991, 1993) concerned the process of information search; however, the model of Kuhlthau put more emphasis on feelings associated with each stage (figure 8) where uncertainty occurs in the first stage to decrease gradually with the progress of the research. Kuhlthau proposed a model that consists of six stages and in each stage there are three common patterns (feelings, thoughts, and action) as presented below:

- *Initiation:* in this phase user experiences the feeling of uncertainty and having insufficient knowledge about a situation. Accordingly, a need is realised and action is taken to seek and explore possible relevant information;
- *Selection:* where user selects an area or topic to research. The state of thoughts is still vague, though user is a little hopeful that the initial research would lead to further information;

Tasks	Initiation	Selection	Exploration	Formulation	Collection	Presentation
Feelings (affective)	Uncertainty	Optimism	Confusion, Frustration, Doubt	Clarity	Sense of Direction, Confidence	Satisfaction or Disappointment
Thoughts (cognitive)		Vague ⎯⎯⎯⎯⎯→ Focussed				
		⎯⎯ Increased Interest ⎯⎯→				
Actions (physical)	Seeking relevant information, exploring ⎯⎯⎯⎯⎯→				Seeking pertinent information, documenting	

Figure 8: Kuhlthau's model of information search process (Kuhlthau, 1993)

- *Exploration:* in this stage user is still confused and uncertain. Thoughts concern on becoming familiar with the selected topic, while action continue in seeking information, reading and relating acquired information to the known ones;
- *Formulation:* in this stage feelings change from uncertainty to confident, and thoughts are more focused and selective. The task here is to continue information-seeking;
- *Collection:* in this stage feelings are more confident, thoughts are clear, and the task is collecting information that is related to the centre area of research;
- *Presentation:* where feelings are either satisfied or disappointed with the outcomes, and task is to complete the search and present the results (Kuhlthau, 1993).

Wilson (1999) compared the models of Ellis and Kuhlthau to find them very similar in some activities. Wilson stated that Kuhlthau's model is more general than Ellis model, in which activities involved in Ellis' model characterise the stages of selection and exploration in Kuhlthau's model.

Marchionini's model

Marchionini (1995) proposed eight processes to the information seeking that start with recognising a problem and continue with different processes until solving problem or giving

up the processes. Marchionini (1995: 49) stated that the process of information seeking "is both systematic and opportunistic", and it depends on the decision taken by information seeker and the manner that the different factors of information seeking (explained earlier) interact during the processes. The model of Marchionini involves eight sequential processes that also interact with each other through different sets of sub-processes that Marchionini (1995) called them functions or activity models. However, the processes of information seeking stand as:

- Recognise and accept an information problem;
- Define and understand the problem;
- Choose a search system;
- Formulate a query;
- Execute research;
- Examine results;
- Extract information, and
- *The reflect/iterate/stop* (Marchionini, 1995: 51-58)

Further, Marchionini (1995) defined three sub-processes:

- The first sub-process is purely mental and performed on the behalf of understanding the information problem that is first recognised, accepted, and then defined.
- The second sub-process is planning and executing the actual activities of information seeking that depend largely on problem definition. It involves both mental and behavioural activities: the choice of system, formulation of search query to perform the research and then evaluate the results.
- The third sub-process is mental and devoted to the information evaluation and use where result is examined; information is extracted and used to solve the problem. Problem may not be solved from one research where information seeker needs to repeat or may stop the search.

This model of Marchionini (1995) presents a general and comprehensive picture of the information-seeking process in the electronic environment. It involves mental and

behavioural activities, yet unlike Kuhlthau (1991) and Wilson (1996) feeling and factors from outside the domain are not placed in this model.

Apparently, all information-seeking and searching models, reviewed previously, are triggered by information needs (Wilson, 1981, 1996) either articulated as a gap (Dervin, 1983), uncertainty (Krikelas, 1983; Kuhlthau, 1991), or a problem (Marchionini, 1995). No matter how general or specific the model is, the issue is about the processes that occur to reduce uncertainty, bridge a gap, resolve a problem or satisfy a need.

ISB of historians

As it is previously agreed that designing IS that best meets its users' needs; is established on the understanding of users' information needs and seeking behaviour. In the literature on archival studies, there are a few studies that investigated the ISB of historians, and only a few archivists were interested in studying users of archives (Duff and Johnson, 2002). This is because archivists were resistant to the social and behavioural techniques used to identify users' needs such as the ones that were applied in libraries; adding the difficulties in defining the information needs of users of archives (Lytle, 1980). For this, Lytle (1980) and Hernon (1984) called for more empirical and user studies to understand the information needs and seeking behaviour of archive's users

The ISB of historians is considered as a part of social scientists; however, the major concern of this section is devoted to the studies that concerned only historians. Regarding historians as part of social scientists, Ellis' model (1987, 1989) of information search (presented in the previous section) can represent the historians' activities when conducting research: starting, chaining, browsing, differentiating, monitoring, extracting, verifying, and ending. Another model of social scientists is the one that was developed by Meho and Tibbo (2003) where they revisited Ellis' model of ISB to identify four additional features: accessing, networking, verifying and information management. Even though, verifying was added by Ellis (1993) in his extended research, Meho and Tibbo (2003) stated that verifying activity was assigned by

Ellis in relation to physical scientists, but not to social scientists. Access was shown to be fundamental in the information-seeking process due to the difficulties faced when accessing sources; especially the primary ones in archives and foreign national libraries. Networking was added as kind of activities related to communication and sharing information, while information management appeared essential in terms of organising the collected information to easily retrieve them when need occurs. Verifying was related to the activity of checking reliability and accuracy of collected information as well as research results.

By this, the ten features of ISB (starting, chaining, browsing, differentiating, monitoring, extracting, accessing, networking, verifying, and information management) of social scientist were grouped in four main interrelated stages:

- Searching stage is devoted to identify relevant sources by approaching the activities of starting, chaining, browsing, monitoring, differentiating, extracting and networking;
- Accessing stage is defined by Meho and Tibbo (2003) as a bridge between the initial searching stage, where required materials are identified, and the processing stage where information would be used. This stage is also related to decision making.
- Processing stage indicates the activities of analysing and synthesising information; while
- The ending stage indicates the end of the research process.

Similar to Ellis' model, features involved in this model are not said to be entirely occurred or sequentially approached; information seeker can approach any type of activity and move between stages as his/her need entails. As the research of Meho and Tibbo resulted in adding new features to Ellis' model of information searching behaviour who studied a similar user group (social scientists), it could be argued that regarding the ISB of historians; there are other searching features that particularly pertain to historians. This is what Rhee (2012) recently confirmed in her research in an attempt to model the ISB of historians.

Cognitive approach of historians' ISB

Before proceeding to Rhee's model, the very recent one, it is essential to review the ISB of historians in earlier studies. From the early studies that considered the cognitive aspects of collecting and using information in historical research is the one that was done by Case (1991a) who was interested in what motivate historians to do research, choose a topic, carry on with research and write manuscript. According to Case (1991a), historians choose a research topic motivated by interest, and their investigations are mostly directed by question or problem. Historians work from their notes that are usually recorded on cards and categorised by concepts that serve the writing of research manuscript. Case (1991a: 80) argued that to "employ a problem oriented model of information services"; a deep understanding of user's information needs and uses is entitled, and this deep understanding can be gained by focusing on a specific user group of historians. Further he stated that understanding the works of scholars themselves; rather than studying their use of sources can effectively help serving their needs.

This study was extended to investigate how historians store and index relevant materials for future retrieval (Case, 1991b). Case (1991b) found that historians organise their texts by space, form, topic, and purpose. Essentially, the use of card metaphor was frequently used by historians in labelling and conceptualising their topics, texts and ideas, which lead Case (1991b) to suggest applying the use of analogy and metaphors to IRS.

Cole (1998) made a significant effort studying the cognitive activities of the information acquisition, and knowledge structure of PhD history students; considering their thesis as a cognitive product. The knowledge structure of history PhD students was described by the metaphors *picture* and *jigsaw* in which picture denotes thesis background and jigsaw denotes thesis structure. Information process was introduced in a four-stage model: *opening of the information process*, *representational activities of information*, *corroborating evidence looked for and found*, and finally the closing stage (Cole, 1998: 44). Cole (2000a, b) extended his research investigating the name collection behaviour of PhD history students where he

proposed the use of names to collect information in IRS as a method of inducing experts' cognitive structure of historians.

Archival approach of historians' ISB

In this context, Duff and Johnson (2002) studied the ISB of historians when searching archival materials to propose four types of activities approached by historians (2002: 478-479):

- *Orientation* indicates starting activities where historians orient themselves to research topic, relevant sources, finding aids, and archives. Especially, in the beginning where historians may not be familiar with their research or topic area. Orientation is approached by visiting archives, searching finding aids or talking to archivists;
- *Seeking known material:* as the first exploration stage results in identifying a list of potential sources or helpful information to start with such as names, or citation; the task now is to find and access these materials;
- *Building contextual knowledge:* is required to understand not only the contents of a record by also the relationships between this record and others. Accessing a source can leads historians to identify names or organisations that seeking them can again give useful clues and lead to further information that helps interpreting event in the light of relationships with other records;
- *Identification of relevant material:* exploring the context of sources leads historians to identify more relevant materials through searching subject indexes, performing a word search, or asking archivists.

Duff and Johnson (2002) clarified that seeking known materials can occur in any stage of research, while building contextual knowledge and identifying relevant materials occur in an iterative manner. Duff and Johnson (2002) in their conclusion minimised the role of serendipity, rather they reasoned the discovery of useful sources to the deliberate tactics of expert historians in exploring the context of sources. Interestingly, historians were found to be highly dependent on archival finding aids in reducing uncertainty and orientating themselves to new sources and archives, adding their role in sources' identification and building context knowledge. Furthermore, historians liked collecting names likewise in the

study of Cole (2000a), and talking to archivists as an informal source of information to benefit from their knowledge and experiences regarding the archival contents. While this model did not concern the cognitive aspects of historians seeking behaviour, its significance comes from being the first study to give a comprehensive picture of the ISB of historians in archives.

Back to the recent attempt of modelling the ISB of historians; Rhee (2012) carried on a study to update the model of Meho and Tibbo (2003) to fit the ISB of historians. Rhee's Model (2012) consists of four stages (searching, accessing, processing and ending) and in each stage there are a set of activities undertaken by historians during their seeking behaviour (figure 9). Rhee approached her research by employing content analysis of literature in the fields of library and information science, archival studies, and history; seeking holistic and divers view of how historians do research. Apart from the activities included in Meho and Tibbo's model (2003), Rhee added three types of activities that historians performed during their search:

- Orienting, as explained previously in the Duff and Johnson's model (2002), is related to the type of activities performed by historians to know about archives, their contents, and finding aids. Orienting was cited in 12 studies and mentioned 25 times. According to Rhee (2012), historians approach activities of orientation because they are not familiar with archives as they are with libraries, adding the difficulties of using archival finding aids, for which they need to be familiar with system in archives as well.

- Constructing contextual knowledge: is essential to understand records, interpret events, and re-tell stories. Constructing contextual knowledge was cited in 18 studies and mentioned 34 times. This contextual knowledge helps understanding the creation circumstances. Essentially, gaining knowledge about organisations and individuals involved in the creation of a record contributes in understanding the relationships with other records. Rhee (2012) related the construction of contextual knowledge to other feature as differentiating, browsing, information management and assessing.
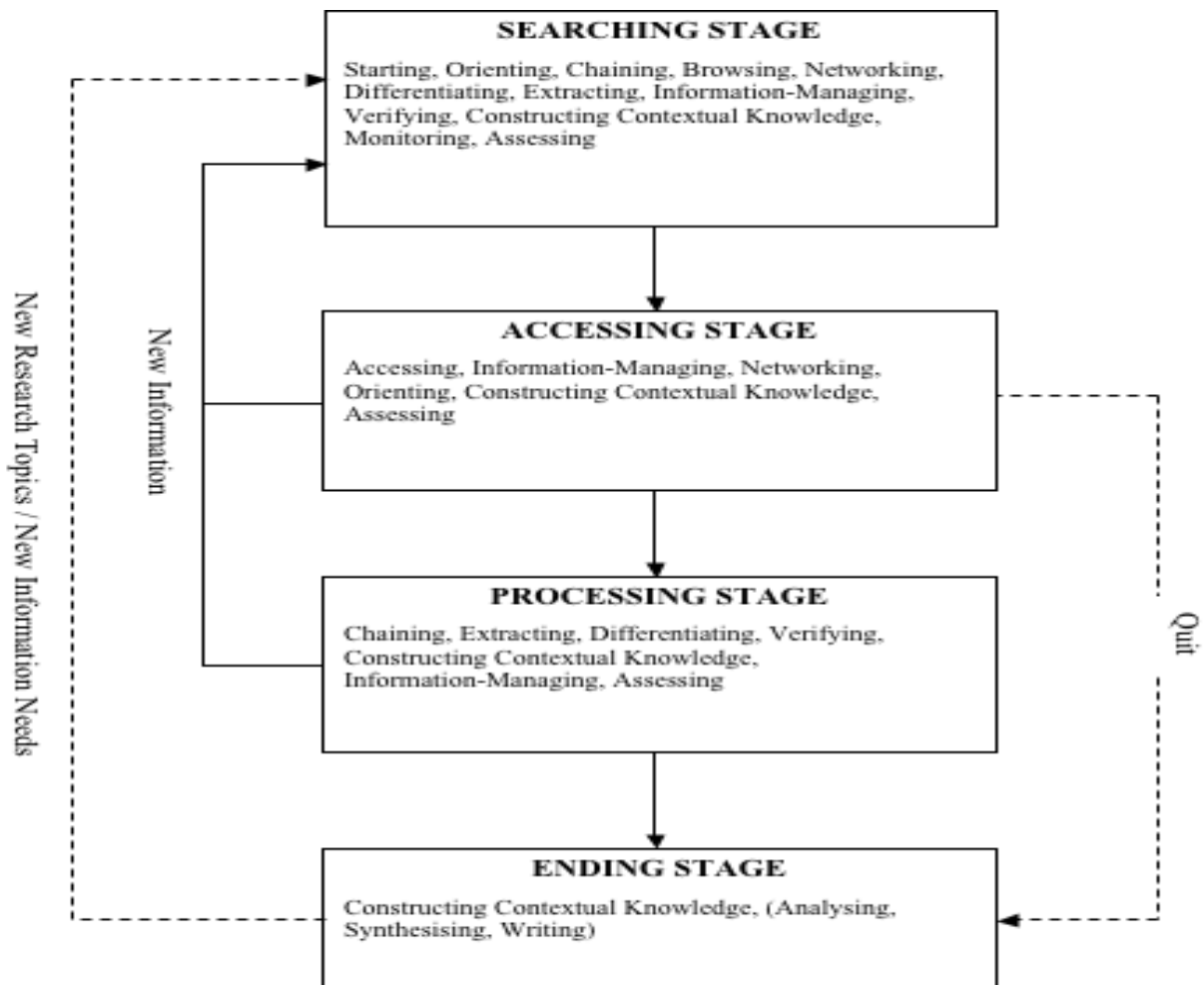
Figure 9: Rhee's model of ISB of historians (Rhee, 2012)

- Assessing indicates information evaluation in terms of quantity, quality and its significance to the research topic. Content analysis presented assessing as an important activity to historians where it was the most cited activity to be referred to in 28 studies and mentioned 38 times. Rhee (2012) stated that assessing affects the decision of moving between stages, in which evaluating the outcome of every stage against information needs decides whether to move forward or backward to repeat certain activities.

The significance of this study comes from establishing differences between the ISB of social scientists and historians. Further; Rhee (2012) proposed seven recommendations to enhance

the archival system; insisting the importance of understanding the information needs of historians and encouraging the collaboration between archivists and historians.

However, it is suitable to conclude this review of ISB of historians with the universal model traits of historians (Smith, 2004). Significantly, Smith reviewed user studies of historians over two decades (1980- 2004) and she concluded that changes occurred to some information-related activities such as accepting and using IT and electronic sources, while other activities did not change at all, for which she proposed a model traits of key behaviours that remained stable without any changes:

- *A tendency to work independently:* historians were said to avoid the assistance of librarians (Orbach, 1991); yet not archivists (Duff and Johnson, 2002);
- *An emphasis on browsing:* in which most of the reviewed studies mentioned the importance of browsing and serendipity for historians;
- *A preference for primary sources:* was stated in all reviewed studies;
- *The importance of context* in understanding one record in the light of its relationships with other records, which makes historians use *interdisciplinary materials and approach*es (Smith, 2004).

Historians approach several similar patterns of information seeking to those in the field of social science, other pattern of activities are distinctive due to the nature of historical research; particularly dealing with primary sources, in addition to the importance of acquiring contextual knowledge. Taking this in consideration when designing or developing IRS of archival primary sources seems promising to satisfy the information needs of historians.

Summary

The rationale for understanding the information needs and seeking behaviour of system users has been demonstrated. Information needs have been theoretically reviewed in terms of definitions, difficulties, and necessities. Similarly, ISB has been reviewed regarding definition,

types, and factors. Several models of ISB were presented, and a particular concern was paid to the models of ISB of historians.

Part 3: Creativity

The first two parts of the literature review concerned IRS, information needs and seeking behaviour under the believe that these areas are interrelated in the way that understanding the information needs and seeking behaviour of users assists the design of IRS that best serves users and meets their needs. ISB is usually motivated by having insufficient information regarding a problem, task or situation where individuals go through different processes to acquire the information that would help. However, in the community of scholars this ISB is supposed to come up with new and original ideas or solutions. This study is interested in exploring the ways that IRS of digitised sources can help in stimulating the creativity of historians. For this, there was a need to explore the area of creativity, how it can be stimulated and how IRS can support in this regard. This part is looking at creativity from the view of psychology to understand the nature of creativity, along with reviewing several studies that concerned the role of IS in stimulating creativity.

The nature of creativity

From a historical view, creativity, as a research area, was neglected and hardly mentioned in the field of psychology due to its mystic and spiritual origins; until the second half of the twentieth century where only a few research institutes were interested in creativity, and the first journal of creativity *Creativity Research Journal* was established only in 1988, while the first conference on creativity was held in 1995 (Sternberg and Lubart, 1999; Sternberg et al, 2002). The matter of creativity is that it is related to different areas of psychology such as; cognitive, personality, social and others areas, which causes creativity to not be a distinctive subject by itself (Sternberg et al, 2002). Nevertheless creativity as a subject can be situated in the area where intelligence and personality are crossed (Eysenck, 1994). Albert and Runco (1999: 16) described the history of research in creativity as the "slow boil", and Boden (1994) considered creativity as a mystery because usually inventors cannot tell how their creative ideas occurred. Similarly, Guilford (1975) confirmed that some tasks in the thinking process are done unconsciously. Martindale (1999) elaborated that the creative act does not happen only because of the logical reasoning and thinking; rather it appears as an unexpected insight

because this happen in a mental state where the attention of individual is not focused such as when sleeping, walking or in a bath.

Creativity denotes the production of something that is *novel*, *valuable* (Weisberg, 1993; De Bono, 1992, Gilhooly, 1996; Leonard and Swap, 1999; Sternberg, 2006) and *surprising* (Boden, 1990). Runco and Jaeger (2012) stated in their review that originality and effectiveness are standard elements in defining creativity. In terms of novelty, Boden (1990, 1994) distinguished between two types of creativity: psychological creativity and historical creativity. Psychological creativity refers to the generation of a valuable idea that is considered new to the one who generates it, while historical creativity means that the generated idea is unique and no one in the human history had come up with it before. Rhodes (1961) sought in his article *an analysis of creativity* to configure a standard definition for creativity; rather he came up with a 4Ps system of creativity that stands for:

- *Person*: denotes an individual who corporates his/her personality traits, cognitive skills and behaviour to come up with a creative product;
- *Process*: denotes the stages that a creative person goes through to produce a creative product;
- *Product*: denotes the outcome of the creative process that is required to be novel and useful;
- *Press*: denotes the relationship between the creative person and environment.

Indeed, the best way to define something is to understand its mechanism. Exactly as Rhodes did by considering creativity as a system and classifying it into four components in which knowing these 4Ps is very essential to understand the holistic view of creativity.

Weisberg (1993) clarified that creativity can be seen from two different views: one as genius in which creativity results from an extraordinary thinking such as the case of Picasso, Einstein or Mozart. The another view of creativity is the ordinary one in which creativity results from an usual thinking as all people do in solving problems. Similarly, Arieti (1976) clarified the

difference between ordinary creativity and great creativity; stressing the importance of both types for individuals as well as for the entire humanity. It is possible to say, if crossing information between Doden (1993) and Weisberg (1993) that historical creativity corresponds well with the genius view of creativity, while psychological creativity matches the ordinary view, which means that everyone is creative or can be helped to be creative as is explained in the next section.

Enhancing creativity

In the literature of creativity, there is unsolved debate around the issue of enhancing creativity and a very few researches tackled this issue directly (Nickerson, 1999). Martindale (1999) considered creativity as a rare trait because it should be accompanied with some other traits that are hardly for them all to exist in one person. Weisberg (1993) considered flexibility of thoughts, extraordinary sensitivity to environment and detecting problems as personality characters of genius that exist in everyone, but in different degrees. According to Weisberg (1993), everyone could be creative; however, some fail due to lacking motivation and commitment; plus not being expert in the domain they work in. Likewise, Boden (1990) who declared that, to some degree, everyone is creative. De Bono (1992) argued that considering creativity as a talent that a person born with is misleading, rather he declared that it can be taught as any subject and developed by training and practicing thinking techniques. De Bono (1992) introduced a set of techniques that facilitate lateral thinking to help in problem solving and producing creative ideas. In turn, Weisberg (1993) discussed that creativity can be improved by providing the appropriate environment that encourages people along with boosting motivation and interest.

According to Davis (1999: 19-27) everyone have the ability to be creative; however, there are some elements that block creativity such as *habits and learning*, *rules and tradition, perceptual and emotional blocks, Cultural blocks,* and *sources barriers.* In turn he presented a number of techniques to stimulate idea generation for example; brainstorming and brainwriting techniques, attributes listing, and ideas checklist.

Stein (1974) used two methods to stimulate the creativity of individuals. One method is related to personality characters and involves techniques to help overcoming any barriers or difficulties that constrain the creative process such as; *role playing* technique that helps a person to overcome personality blocks, *hypnosis* which helps reducing defensiveness and increasing self-confidence, and *psychotherapy* to help overcoming some problems, freeing individuals energy and focusing abilities. Another method is devoted to enhance the cognitive process involved in creativity, which are: *knowing, learning, understanding, perceiving* and *problem solving (*Stein, 1974: 83)*. These cognitive process techniques are divided into three stages according to stein's creative process where every stage involves certain techniques:

- Techniques to stimulate hypothesis formation are brainstorming, morphological analysis, sttribute listing, checklist, forced relationships and others;
- Techniques to stimulate hypothesis testing like knowing yourself and being aware of what methods work best with you, maintaining a high level of motivation, learning new ways of doing things or solving problems, going out of the field for a while, and many others;
- Techniques to stimulate communication of results can be summarised in knowing the audience and overcoming the stress that may occur in this stage by appraising the benefits of sharing creative idea with individuals and public alike.

Stein (1974) also stressed the importance of education and stated that stimulating creativity starts in an early stage of individual's life where education, knowledge acquisition and experiences could influence creativity. In the same way, Amabile (1983) considered the influence of education on creativity as one of the social and environmental factors along with work, family and culture. In fact, the influence of school and family on creativity seems greater than the other factors mentioned by Amabile because they start in an early life of individuals and play a very big role in formulating their personality and cognitive characters. This might justify that some cases of psychological blocks are rooted back to childhood when experiencing bad situations. However, Amabile (1983) stated that creativity can be enhanced, but not in a short time; especially when developing skills that are related to domain and creativity because they involve many aspects that are related to knowledge, personality traits and cognitive style, meanwhile creativity can be easily developed regarding task motivation.

Creativity can be stimulated by enabling people to recognise and develop their strength and abilities to generate creative ideas; rather than teaching them certain strategies (Treffinger, 1993). In fact this point of Treffinger makes sense in term of rooting creativity in the abilities that individuals already had. By this, creativity is encouraged to be a constant talent, rather than a learnt strategy or exercise in a training course that would be practiced for a period of time and forgotten after that. Similarly, Lubart (2001) stated that training creativity may not be that efficient if people do not know how to integrate the learnt strategies into their work.

Sternberg, et al (1997) reasoned the fail of creativity training programmes to their focus only on creative thinking, while creativity requires six other collaborating elements:

- Knowledge: knowing rich information of the one's discipline (previous and current knowledge);
- Intellectual ability: of generating and evaluating ideas;
- Thinking style adopted by creative people is usually the novel thinking that deals with ideas or situation in a way that no one approached before;
- Motivation: is about not losing interest; and having the ability to always move on and enjoy;
- Personality: such as taking risks in account and being determined to move on;
- Environment: in which one values the benefits and considers the risk.

 Indeed, thinking creatively cannot stand by itself unless it is built on the existing knowledge to generate new hypothesis, and deal with it as no one did before. One cannot be creative in a discipline that he/she does not like, adding that being motivated and determined to evaluate and overcome any risk may occur are very essential.

As Csikszentmihalyi (1996, 1999) mentioned that creativity does not happen in the mind separately from the social and cultural context, it happens because of the interaction between the components of the creative system: *domain*, *field* and *individual*. Csikszentmihalyi (1999) insisted the importance of internalising the components of creative system. For an individual

to bring on an effective contribution to his/her field, it is necessary to adopt basic rules from the domain, and basic views from the field. Accordingly, one can choose to work with the ideas that are potentially creative and useful to the field.

Nickerson (1999) acknowledged that creativity can be enhanced by teaching in classroom, though he doubted the ability of computer software, designed to enhance creativity such as the ones used in composing music or designing architecture, in enhancing creativity of people. His doubt was elaborated when asking whether Shakespeare's work would be better if he had a word processor. Nickerson's answer was *No*; indicating that the creativity of Shakespeare would not be more improved if he had any technology to aid his work. Nickerson may be right in his statement; however, we might be having more works of Shakespeare, than what he produced, if he only had a word processor. However, Nickerson (1999) stated that the potential role of technology to enhance creativity needs to be further questioned and researched. Mayer (1999) also suggested that creativity needs to be more addressed from a computational point of view because this computational approach is precise and enables testing theories of creativity.

After learning that, it is not necessary to be a super intelligent or genius like Einstein or Da Vinci in order to produce creative ideas, or solve problems that may occur in one's work, study or life. Clearly, everyone can be creative and creativity can be simulated using different thinking techniques. Next is a demonstration of the different processes that creativity happens through.

The process of creativity

In the literature there are various models that explained how creativity happened, and identified the processes or stages that a creative person goes through to produce new thoughts or solve problems. One of the basic models of idea generation is the one introduced by Wallas (1926) where he identified four stages of thought process:

- *Preparation*: where a problem is defined and well investigated by gathering rich information about the problem;
- *Incubation*: in which thinking about the problem is happening unconsciously;
- *Illumination*: where a new idea or solution comes up unexpectedly;
- *Verification*: is the final stage where testing the validity of the generated idea takes place.

Obviously, the model of Wallas (1926) combines between conscious and unconscious stages. The middle stages, incubation and illumination, occur out of the individual's awareness, yet they, especially incubation, based on the conscious work done in the first stage. Preparation and verification are completely performed with a full awareness of tasks and objectives.

Stein (1974: 19) claimed that creativity is a process that yields new idea and accordingly he defined three main stages of the creative process, which are:

- *Hypothesis formation* that involves gathering information and combining them to form an idea;
- *Hypothesis testing* that entails checking the validity of generated idea; and
- *Communication of results* and discuss them with others in the field who are able to judge the generated idea.

Each of these stages entails different requirements of individuals in terms of their cognitive, personality and social characters.

Lubart (2001) argued that the four-stage creative process that was dominant in the 20th century are now very much criticised for their limitation of the mental processes. Creative process entitled to be more detailed in terms of performing sub-processes. He also discussed the issues of what leads the creative process to creative or non-creative product, proposing a need to distinguish between the creative and non-creative processes. Lubart (2001) and Weisberg (1999) proposed that the level of knowledge used in each stage of the creative process is the main difference between creative and non-creative thinking.

Another popular model of the creative process belongs to Amabile (1983: 78) that consists of five stages:

- *Task presentation*: where an individual recognises that there is a task or problem;
- *Preparation*: indicates gathering relevant information or reactivating the relevant information stored in mind;
- *Response generation*: by identifying response possibilities to generate the novel idea or solution;
- *Response validation*: to evaluate and assess the usefulness of the generated idea or solution; and finally
- *Outcome*: is the result of the validation stage, which may yield a novel idea or solution, failure, or a need for more development.

Further, Amabile (1983) incorporated this model with three components of creative performance (*task motivation*, *Domain-relevant skills*, *and creativity-relevant skills*); showing the influence of these three components on the creative process. Task motivation greatly influences task presentation and response generation because if one is interested in task or problem, he/she will be successfully involved in the process. Domain-relevant skills are very important to task preparation in order to gather the information that is relevant to task and domain. Again, domain-relevant skills influence the validation stage where solution is tested against the domain relevant criteria, and its usefulness to the field is also assessed. And finally, creativity-relevant skills have an essential impact on response generation where the cognitive skills and thinking style help the novel generation of ideas or solutions.

Interestingly, the componential framework of creativity that Amabile developed is based, to a great extent, on cognitive processes and she did not include any unconscious stages as in the models of Wallas (1926) and Young (2003). Young (2003) introduced a five-stage model of producing ideas, which starts with gathering materials/information about the problem and its context, then working on this information to create relationships between them. The third stage is incubation where the unconscious mind synthesises gathered information.

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Consequently, the new idea is born to finally develop and enhance it by sharing it with other people allowing criticism that helps shaping the idea.

Based on reviewing various models of creativity, Mumford, et al (2012) developed a comprehensive model for creative thinking process that consists of eight phases (figure 10); starting with a problem definition and gathering information around this problem to help understanding its context. Organising information and exploring the conceptual connections between them are performed in a novel way to generate a new idea. The contribution of this model comes from extending the processes to further evaluate, implement idea and monitor solution. According to this model, creativity is not just about generating a new idea, this idea is required to be of a high quality and useful when it comes to implementation. However, this model presents creativity as a complex phenomenon that involves various cognitive processes that in turn depend on different strategies to be accomplished.
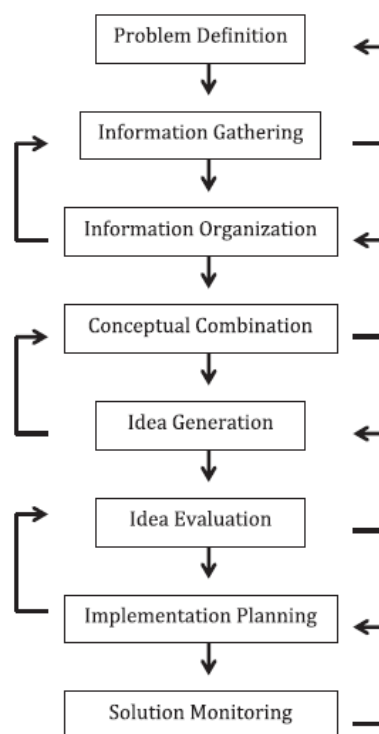
Figure 10: Creative process model (Mumford et al, 2012)

From this review, the role of information appears clearly essential in the preparation stage of the creative processes. After defining or recognising a problem or task, there is a preparation stage as called in the models of Wallas (1926) and Amabile (1983), or hypothesis formation in Stein's model (1974), which entails gathering and managing information as indicated in the model of Mumford (2012). Gathering rich information that is relevant to the current task or problem identified in one's field; appears to be a very crucial source of generating creative idea (Amabile, 1997; De Bono, 1992). Understanding the problem/task is essential as an initial step in generating solutions or new idea, thus reviewing the existing knowledge of problem-related field is required to enrich or update the information stored in one's mind. This reveals the importance of IRS in facilitating information search and retrieval.

These models presented creativity as a set of processes that end up with original ideas, though it is not necessary for these processes to be entirely applied. Creativity can be approached in different ways according to the one's style of thinking. These different approaches are investigated in the next section.

Types of creativity

Generally, there is no fixed method or strategy to produce new ideas or handling problems. Creative idea can be generated by exploring new area of a field, making a new combination of two different areas or ideas, or investigating an area or problem from a new or different perspective. Boden (1990: 3-6, 1994) identified three forms of creativity:

- By *making unfamiliar combination of familiar ideas*;
- Exploratory creativity in which one comes up with a new idea within a *conceptual space* or *structured style of thinking.* This form of creativity enables the exploratory of ideas, possibilities or limitations that were not captured before; and
- The third form of creativity involves generating new ideas by transforming the existing style of thinking, especially when realising a limitation in the conceptual space and then a change is helpful in overcoming this limitation.

By this, Boden (1990) defined three types of contributions (combining, exploring, transforming) that an individual may approach to bring creative ideas to his/her field. In the same way, Sternberg et al (2002: 11-12) identified eight kinds of contributions that creativity brings to a field, and in turn these contributions are classified into three groups according to the attitudes towards the paradigm of the field:

Creativity that accepts the current paradigm and attempts to extend them:

- *Replication:* where individuals feel that the field is in its correct place and any contribution to the field would be in the same track;
- *Redefinition:* where individuals look at the current issues of the filed from a new point of view;
- *Forward incrementation:* where the contributions of individuals take the field forwards in the usual direction to a point that others expect or ready for;
- *Advance forward incrementation:* where the contributions of individuals lead the field forwards in its usual direction to an advance point above the expectations of others.

Creativity that rejects the current paradigm and attempts to replace them:

- *Redirection:* where the field is taken to a new direction;
- *Reconstruction/redirection:* where the field is first taken back to a previous point in order to reconstruct it from the past, and then take it into a different direction;
- *Reinitiation:* where the field or just an area of the field is moved back in order to restart in a new direction.

Creativity that synthesises paradigm:

- *Integration:* by merging two different aspects of ideas to form a new direction of a field.

Interestingly, these classifications can contribute to one's method or strategy of generating new ideas. Yet for some people, they may not bother with these kinds of contributions, rather they just approach their tasks as they go, especially that part of the creative work happens accidently (Sternberg et al, 2002).

Integration or combination was also mentioned by Young (2003) who believed that a creative idea is a new combination of old elements that depends mainly on the ability of seeing relationships between elements. Likewise, Michalko (2001) considered the abilities to *connect the unconnected* and create novel combinations of ideas or thoughts; as strategies of creative genius. Further strategies were identified by Michalko (2001: 10-13) such as *thinking fluently* and flexibility that results in lots of ideas, *looking at the other side*, *looking in other worlds*, *Finding what you are not looking for*, and *awakening the collaboration spirit.* Michalko (2001) discussed these strategies in his book *Cracking Creativity* and provided a set of techniques to improve the ability of generating creative ideas. Even though these strategies are related to creative genius, one can benefits from these techniques, especially that Michalko (2001) believed that geniuses are not super mysterious people; rather they work hard, extend their thinking further, and never stop elaborating ideas.

However, these strategies stimulate the thinking further to an important question: what kind of creativity can an IRS support? IRS is not entitled to establish which kind of contribution to go with; rather it may help in the way of presenting the relevant information and knowledge-based field. This issue has been a concern in the field of information and computer science where some studies investigated and proposed some ways of stimulating creativity through IS. The following section is exploring the role of IS in supporting creativity.

Creativity and IS

Comparing to the field of psychology, creativity is not well established in the fields of information and computer science (Bawden, 1986; Couger, 1990; Couger et al, 1993; Shneiderman, 2007; Burkhardt and Lubart, 2010; Seidel et al, 2010) and lots of developments are needed in this area, especially that the opportunity to share knowledge and work together between researchers from both disciplines is promising (Edmonds and Candy, 2005). Creativity is not restricted to one area or field of the human knowledge; it is related to every discipline and facet of our life. Mitchell et al (2003) distinguished between three domains of creativity, in turn they emphasised the relationships between each two domains, and placed IT in the centre (figure 11) to highlight the relationships between IT and creativity in all

domains. The interaction between IT and any domain of creativity can be seen as advance computer application in one domain such as computer music or graphic design software.
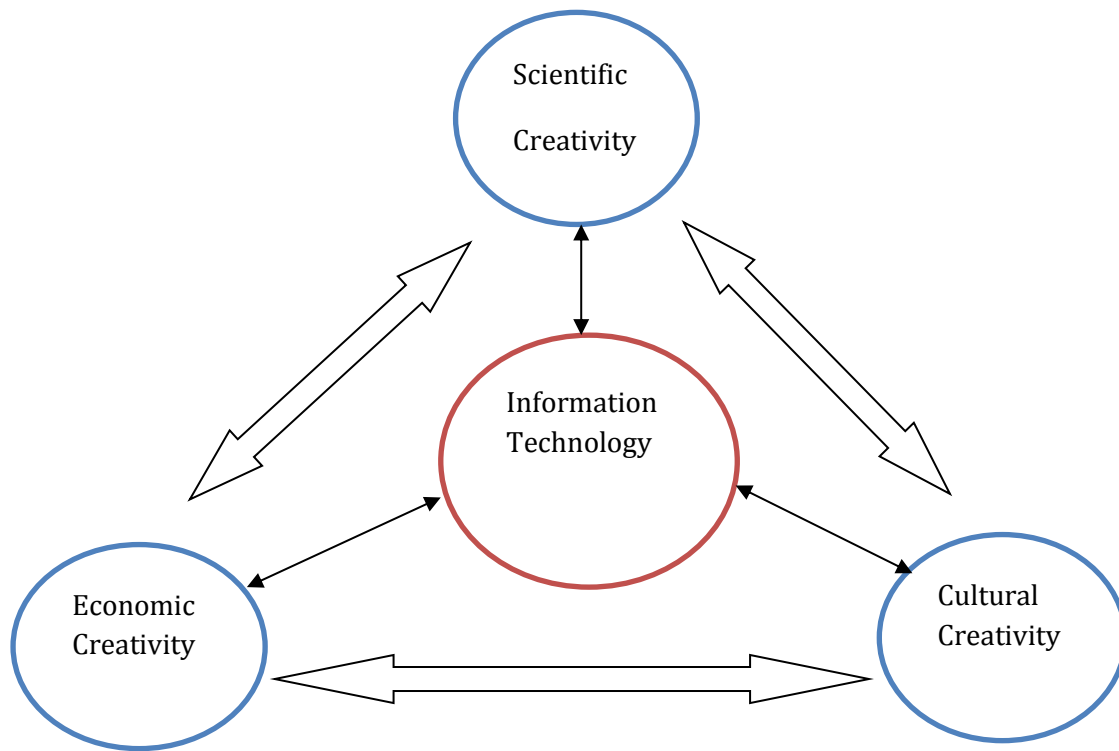
Figure 11: IT and domains of creativity (Mitchell et al, 2003: 25)

Mitchell et al (2003; 26) described the role of IT as *glue* to the domains of creativity; elaborating that the efficiency of this role comes from:

-   *Generalisation*: that refers the ability of effectively applying the same digital tools and techniques in several domains;

-   *Integrity*: where the ability of effective integration of digital technologies helps producing efficient and multipurpose productions and systems that support creativity;

-   The productions of information technologies support the *formation of non-geographic clusters of creativity*;

- The *amplification effects* of information technologies are potentially having multiplier effects.

This domain model of creativity establishes for the association between two concepts (information and creativity) that are essential in every field of the human knowledge; however, this relationship, till recently, was not well defined or investigated. Seidel et al (2010) conducted a theoretical analysis study to explore the contribution of IS to creativity. They analysed the contents of five main journals of IS from 1977 to 2009; to conclude a very little contribution with only 27 articles with a major focus on the influence of IT on the creative performance of both groups and individuals.

Due to the lack of studies concerning creativity in IRS, this review is covering some studies conducted in the field of computer science that are somewhat related to the IRS such as; several studies that were conducted by Shneiderman (1998, 1999, 2000, 2002, 2007). Computer-based tools aid creativity in two distinct ways: firstly, by providing access to the existing knowledge that helps collecting information needed for hypothesis and idea generation, which refers to the aspect of information retrieval. Secondly, by enabling the production of artefacts in some domains (Greene, 2002) such as in art, composing music, or architecture design.

Earlier to Greene's statement, Treffinger (1993) declared that developments in information retrieval technologies show potential aids to creativity such as stimulating creativity by showing visual connections between information, or forcing relationships. In the same way, Dewett (2003) reported that using information technologies in organisations supports creativity by codifying knowledge and facilitating communication between employees.

Chang et al (2011) conducted an experimental study to develop a computer system that helps stimulating the creativity of writers in their task of creating stories. They used a computer system that is based on picture-and-attributed-note in an attempt to stimulate users'

imagination when writing a story. Interestingly, the results of their study came to support this task in which computer system did stimulate story creation.

Couger (1990) proposed a creative approach to design an IS to better meet users' needs by integrating techniques of creativity in different stages of IS design as illustrated in table (1).

Stage of design	Techniques	Object
Requirement definition	5Ws and the H (What, Why, when , where, who)	To ensure that all requirements are covered
Logical design	5Ws and the H Checklist technique	To indicate all the potential problems
Physical design	5Ws and the H Manipulating verb technique	To come up with new perspective of any possible problems
Program design	5Ws and the H Attribute listing technique	To cover all the attribute needed in the designed program

Table 1: Creative approach to IS design (adopted from Couger, 1990)

The common objective beyond designing an IS is to satisfy users' need and design the functions that facilitate users' activities. This creative approach of Couger (1990) provides a systematic way in identifying system requirement, predicting possible problems and producing an easy-use system that stimulates creativity.

Shneiderman (1999) developed a genex framework (four stages of generating excellence) (Shneiderman, 1998) by integrating a set of activities that support creativity in the domain of human-computer interface. He identified eight activities (figure 12) to be facilitated in user interface to help stimulating creativity. Activities associated in the first phase (collect) are related to information retrieval that denotes searching and browsing to collect the information that is central to creativity, adding the ability to view data in visual forms.

Genex Phase   **Primary Activity (but can be used at any phase)**

Collect — Searching and browsing digital libraries / Visualizing data and processes

Relate — Consulting with peers and mentors

Create — Thinking by free associations / Exploring solutions - What if tools / Composing artifacts and performances / Reviewing and replaying session histories

Donate — Disseminating results

Figure 12: Genex framework with related activities (Shneiderman, 1999)

In the second phase (relate) activities are related to information communication that facilitates consulting activities about previous works with the community that share the same interest. Activities in (creating) phase are about dealing with information and ideas to create associations between them such as in mind map. Activities in the (donating) phase reflect the presentation and dissemination of findings to related communities such as journals, digital libraries or databases. Shneiderman (1999) argued that facilitating computer-interface design with software that support these eight activities aids creativity, though in turn he stated some limitations. For example, using software of exploring solution may limit people's imaginary, and counselling could be time consuming and unpromising because people want to protect their ideas. Later on, Shneiderman (2000, 2002) insisted the importance of the smooth integration of these eight activities with computer interface design. Elaborating his interest in

creativity support tools, Shneiderman (2007) suggested paying more attention to these four principles when designing computer interface to support creativity:

- Support exploratory search;
- Enable collaboration;
- Provide rich history-keeping;
- Design with low thresholds, high ceiling, and wide walls (multilayer functions).

These articles of Shneiderman demonstrate his interest in designing creativity support tool in computer-based environment to accelerate users' ability in collecting information, generating hypothesis, validating contribution, and finally sharing it with community.

In the same way, Greene (2002) proposed eight characters of computer tools that support creative production such as; *free-pain exploration and experimentations* in which user has the ability to go back or undo mistakes, support the engagement with system contents to encourage learning and discoveries, along with supporting search and retrieval facilities. Collaboration and sharing ideas should be supported as well as *iteration*, *instructive mistakes* and *domain-specific actions* that are necessary to perform. These characters of Greene are proposed to software used in art institution, though characters such as free-pain exploration and retrieval facilities may be recommended in general to any IRS taking in consideration that the characters of IRS should meet the requirements of people and the field that a system is designed for.

Early in 1986 Bawden carried out a research to identify how an IRS aids creativity where he argued that providing a rich environment of information is essential to creativity. Further, he identified four types of information that an IRS should offer to assist creativity:

- *Interdisciplinary information:* that connects subjects that apparently seem unrelated to help thinking outside the subject boundaries. This can be facilitated by using retrieval techniques (index, code, classification) that present information in a way where hidden relationships and analogies can be shown;

- *Peripheral information:* refers the type of information that is not accurately related to one's discipline. This information can be provided by limiting the precision of information search and allowing a loose search;

- *Speculative information*: speculation is considered as a primary element in stimulating creativity and IRS could support this type of information by providing formal and informal communication channels;

- *Exceptions and inconsistencies*: this type of information brings to light the exceptions or gaps existed in the current knowledge of a discipline. Having such a feature in IRS enables users to know the unknown in their subject. *Encyclopaedia of Ignorance* was an interesting example of such information where unsolved problems are presented for debate or future research. Bawden (1986) suggested IRS to present the current state of a discipline along with the implications of recent developments.

This research of Bawden was mostly discussed in relation to traditional IRS (library), and it is applicable to say that some recommendations that he made are currently available in computer-based IRSs such as; searching and browsing facilities. However, the interesting point that he made is encouraging informal communication channels as a way of stimulating creativity.

Ford (1999) argued that IRS could support the creative thinking by enabling information retrieval through the integration of high order knowledge representation and fuzzy reasoning mechanisms. The former helps achieving a high level of abstraction; while the latter helps achieving dissimilarity in which creative thinking depends on. Further to this study, Ford with Eaglestone et al (2007) conducted an empirical study to explore the relationships between computer system and creativity of music composers; mainly to identify any tensions that may affect creativity. Based on tensions and limitations explored in IS, they suggested some improvements to computer software such as; transaction management that enables users to perform multiple activities or switch between applications smoothly. Other improvements entitled support to the visual presentation and free association between data and software tools.

In a distinctive effort, Lee et al (2005, 2007) carried out a two-stage research to propose a model for creative ISB to assist the development of IS in a way that supports the information seeking of users. Initially, they theoretically surveyed the models of creativity and information seeking to establish relationships between the two areas. They used the holistic model of creativity (preparation, incubation, illumination, verification) and Ellis' model of ISB (starting, chaining, browsing, differentiating, monitoring, extracting, verifying, ending) to map the relationship between creativity and information seeking. Lee et al (2005) proposed six stages of creative information seeking:

- Preparation for starting information seeking;
- Chaining information sources;
- Browsing and searching;
- Incubation for differentiating purposes;
- Monitoring and extracting for illumination; and
- Verification of information sources.

This model was examined through two studies: one to perform a direct information-seeking task and another for open-ended task. All stages indicated up were experienced through both tasks. Models were proposed for both direct and open-ended seeking tasks to show that stages in the first task were straight and sequential, while in the open-ended task stages were more complex and interrelated (figure 13).
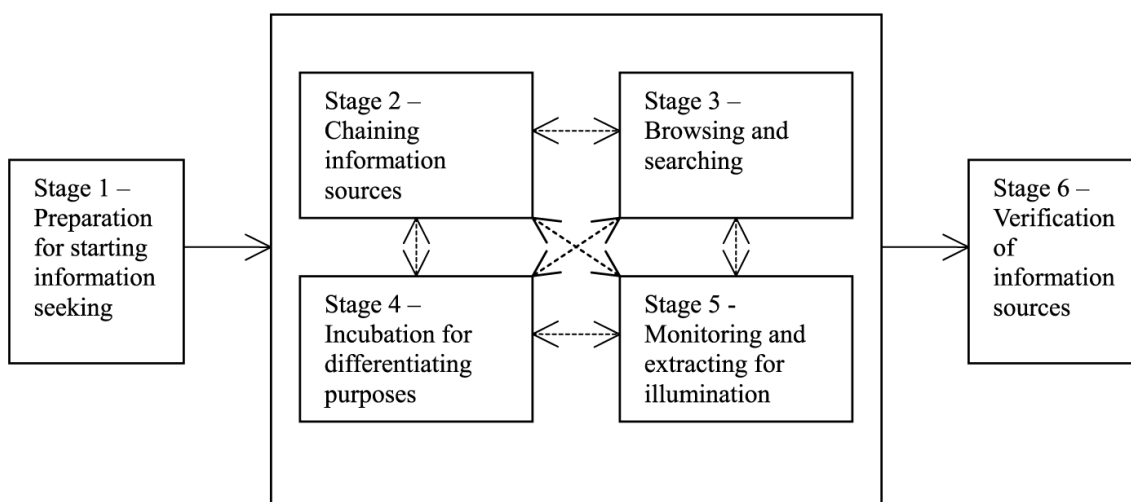
Figure 13: Creative information-seeking model for open-ended task (Lee et al, 2007)

The interesting point that was made by Lee is that creative information-seeking processes do not occur sequentially or straightly; exactly as Stein (1974) mentioned about the creative processes.

Based on the understanding of ISB of postgraduate architectural students with a special emphasis on how creativity may influence the ISB, Makri and Warwick (2010) refined Ellis' model of ISB and suggested that the design of creative electronic information sources for architects should consider the functions that support:

- *Searching:* apart from the normal search facilities that allow defining search in terms of format or content, it is recommended to facilitate the search of similar websites by enabling tagging functionality and thumbnails snapshot;
- *Browsing:* especially the feature that allows users to move between videos, images, and text hosted by the same webpage;
- *Exploring and encountering:* by enabling search-by-image, categorise, rate, provide description for sources, and share images or videos to social networks such as Facebook;
- *Selecting and distinguishing:* by recommending similar images and videos to the displayed one;
- *Visualising and appropriating:* such as displaying image thumbnails, mapping website, and the integration of website information with mapping functionality;
- *Editing:* by allowing easy import for images and videos, for example; cutting section of a video and import it;
- *Recording:* providing easy download and online bookmark functionalities;
- *Sharing and distributing*: by enabling the share of bookmark, tagging images or videos, uploading images and videos with the ability to comment on them.

The design of these functionalities suggested by Makri and Warwick (2010) is highly influenced by the features of Web 2.0 that are commonly implemented to support social

interaction. However, the future of Web 2.0 technologies is promising in the era of IRS such as digital libraries and archives.

An interesting recent study about stimulating creativity was conducted by Fink et al (2012) where they concluded that people can be cognitively stimulated by the exposure to creative ideas of others. This fact supports the idea that IRS could stimulate creativity; especially by providing rich information about previous knowledge or what had been already done.

Reviewing creativity from a psychological point of view is essentially required to understand the mechanism of creativity; how it happens? What types of creative contribution can one brings to a field? Once these issues are known, the possibility of stimulating creativity would be high. Stimulating creativity through an IRS should be based on the theoretical understanding of creativity. The mapping method used by Lee et al (2005) to establish relationships between ISB and creative process was interesting and promising, similarly the study conducted by Ford (1999) when he analysed the creative thinking to propose functions in IRS to support creativity.

Extending the discussion mentioned briefly in previous section (types of creativity) about what type of creativity an IRS could support? Making an inference between the contributions of creativity presented by Sternberg et al (2002) and functions of IRS could propose a new way of stimulating creativity. For example, for the ones who believe in synthesising paradigm and integrating different concepts of ideas, it would be helpful for them to present the indirect relationships between different areas of literature when retrieving information (Swanson et al, 2006) in a way that suggests a novel relationship or a new discovery.

Regarding the fact that information is a very important source of creativity, it is possible to say that IRSs are currently stimulating creativity simply by facilitating information's search, discovery and retrieval. This is the ultimate objective of IRS; however, there may still be other issues that IRS can help with to satisfy the information needs of users and stimulate their

creativity. This issue is highly concerned by this study that is designed to answer different types of questions to assist the comprehensive understanding of the situation under investigation as explained in the next chapter.

Summary

Creativity has been reviewed here firstly from the perspective of psychology to understand its nature in relation to personality traits and the cognitive process. Different perspectives about the possibility of enhancing creativity were presented. Models of creative thinking were also reviewed showing that earlier models integrated both conscious and unconscious process, while the recent models placed more concern on the cognitive process. Several types of creativity were introduced showing the relationship between type of contribution and conceptual space. Concerning the role of IRS in stimulating creativity; several studies were reviewed regarding the proposed features and functions that help promoting users' creativity.

Chapter 2: Research Methodology

Introduction

This chapter is devoted to demonstrate and justify the methodology of this study (figure 14) in terms of philosophical background, research design, approaches and methods' techniques. Ethics is also fully respected and addressed in this chapter considering the issues of informing participants about the study, obtaining their informed consents, and ensuring their confidentiality and anonymity.
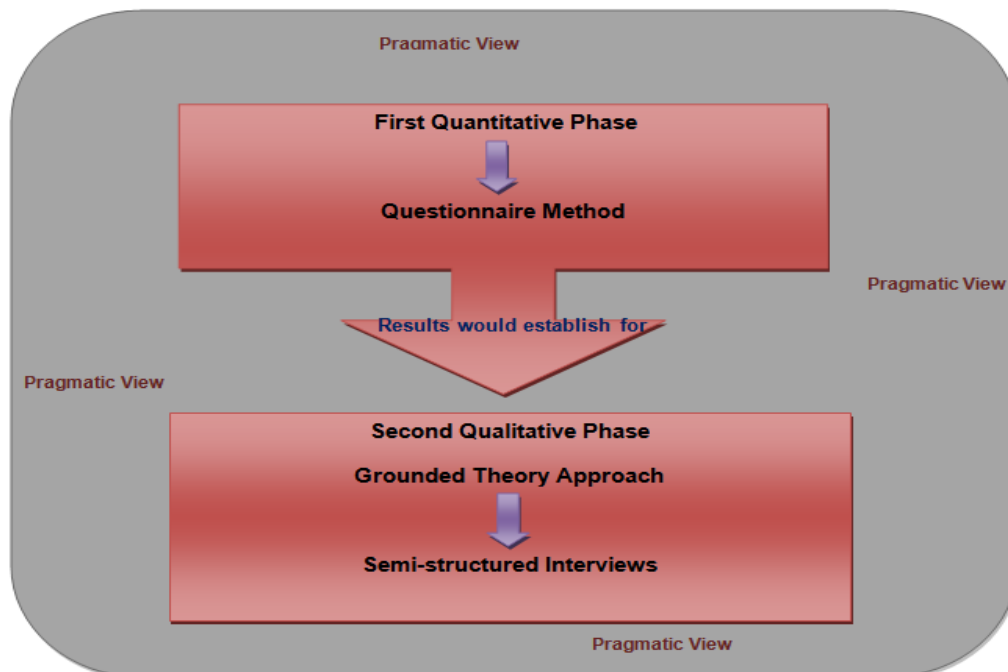
Figure 14: The approached methodology (Author's own)

This research was designed from a pragmatism point of view that fits and supports the flexibility of mixed methods approach. Both quantitative and qualitative approaches were implemented sequentially. Initially, a survey questionnaire was distributed to historians in the UK to establish a context for the study, define problem and sample for the next qualitative phase. Grounded theory was adopted as a qualitative approach using semi-structured interviews to explore historians' experiences when working with digitised historical sources

with the purpose of enhancing an IRS of digitised sources to stimulate the creativity of historians.

Philosophical assumptions

Paradigm, in general, is "the beliefs that guide the action" (Guba, 1990: 17). It is the assumptions that influence our view of the world and the way of conducting a research (Alexander et al, 2009; Punch, 2009; Creswell, 2007). Paradigm is addressed by three types of questions regarding *ontology* (the nature of reality), *Epistemology* (the relationship between the knower and what can be known), and *Methodology* (the way of finding what can be known) (Guba and Lincoln, 1994: 108; Guba, 1990). Answers to these questions characterise the philosophical assumptions that underline different paradigms (Positivism, postpositivism, constructivism, Interpretivism, critical theory).

The emerging issue, regarding the design of this study, pertained to the legitimacy of mixing paradigms. For many years (1970s-1980s), a debate among the advocates of qualitative and quantitative research was unproductively delivered, especially in terms of paradigm talk (Tashakkori and Teddlie, 2003; Creswell, 2003). Contrasts between qualitative and quantitative research (Creswell, 1994; Sale et al, 2002; Bryman, 2004; Tashakkori and Teddlie, 2008; Punch, 2009) are addressed in table (2) to help clarifying this debate. The main concern in the debate between qualitative quantitative traditions is related to ontological and epistemological issues (Sale et al, 2002); where quantitative researchers see truth as objective reality that is separate from the observer. Thus the role of researcher is discovering the truth. Meanwhile, qualitative researchers are much more interested in the experiences of individuals, which consequently affect reality that is socially constructed.

Despite the fact that each of the quantitative and qualitative methods is associated with different paradigms, combining them means bringing together the strengths of both methods

Issue	Qualitative research	Quantitative research
Paradigm	Constructivism	Positivism
Ontology	Reality is socially constructed by unique individual	Reality exists independent of human perception
Research type	Inductive	Deductive
Research nature	Exploratory Discovery	Explanatory Prediction
Research objective	Making sense of people's experiences Contextual understanding Holistic understanding Generating theories	Measuring variables Causes and effects Testing theories Generalisation
Data collection method	Interview, observation, focus group	Questionnaire Experiments
Data nature	Rich and deep data: words, talk, images, sources, or videos	Hard, reliable data: numbers and statistics
Data analysis	Qualitative analysis Time consuming	Statistical analysis Less time
Researcher position	In the research context, interacting, observing, or interpreting	Biased, standing out of the research context.
Limitation	Non generalised	Participants are silent

Table 2: Quantitative vs. qualitative

to compensate the weaknesses embedded by using only one method (Johnson and Onwuegbuzie, 2004). On the other hand, the advocates of the *incompatibility thesis* (Howe, 1988) or purists declare the impossibility of combining quantitative and qualitative methods in one research. Onwuegbuzie and Leech (2005) noted that researchers in the quantitative-qualitative debate focus on the differences between qualitative and quantitative rather than similarities. According to them, being a pragmatic researcher entails using and appreciating both qualitative and quantitative methods in order to get the best of them to answer research questions and gain a comprehensive understanding of the context.

Pragmatism is described as the "philosophical partner" for the research of mixed methods (Johnson and Onwuegbuzie, 2004) that shows more flexibility, and practically approaches research problem (Cameron, 2011). Based on perspectives of Cherryholmes (1992), Creswell (2003, 2009) and Tashakkori and Teddlie (1998, 2003); the philosophy of pragmatism can be summarised as:

- Pragmatists believe that it is the time to put aside the debate about paradigms and just focus on the situation itself;

- Not being strictly dedicated to one paradigm and consequently choosing between methods (quantitative, qualitative), and mixing them ultimately depends on the research question(s);

- Researchers are free to approach the methodological strategy that best match their values, needs and purposes;

- Both of subjective and objective realities are approachable, and reality is what provides the best understanding of a situation.

The primary concept of pragmatism is going with what is suitable for the research; rather than being restricted to one method. The philosophy of pragmatism is not just about "what fits", it also plays as a "middle ground between two opposed but powerful philosophical currents" (Stevenson, 2002: 215; Johnson and Onwuegbuzie, 2004). Pragmatists have disproved the *incompatibility thesis* (Tashakkori and Teddlie, 2008) showing the possibility of

combining paradigms in one research in which the world view can be transferred through research phases (Creswell, 2009). Indeed, collaboration between different methods enforces the research due to the diversity of philosophical thinking, research techniques, collected data, and analytical views.

Concerning the nature of this research, both quantitative and qualitative methods were necessary to answer different research questions, and what worked with this situation was employing both methods sequentially to explore different phenomena.

Research methodology (mixed methods)

Mixed methods research referees the type of inquiry where researcher(s) integrates elements from both quantitative and qualitative approached to serve the purpose of deeply understanding the phenomenon under study (Johnson et al, 2007). Mixed methods research or the *Third Methodological Movement* (Tashakkori and Teddlie, 2003) can be designed sequentially, concurrently (Creswell, 2003; Driscoll et al, 2007; Alexander et al, 2009) or as a bracketed study (Greene et al, 1989). In the sequential study, the strategy of qualitative and quantitative data collection is conducted in phases, there is no matter which one to start first, depending on the research questions. When the priority of conducting quantitative and qualitative is equal, then both types of data are collected concurrently, while in bracketed design; one method is to be applied before and after another (Greene et al, 1989).

Purposes of mixed methods vary according to the research problem and the way that researcher views and considers the research problem and context. Greene et al (1989) identified five main purposes beyond using mixed methods: triangulation, complementarity, development, initiation and expansion. Bryman (2006) identified sixteen purposes of conducting mixed methods. Similarly, Creswell (2007), Tashakkori and Teddlie (2003) were interested in the rationale for mixed methods (Table 3).

In general, the key motivation of mixed methods is knowing more about a topic by combining the strengths of different methods to better answer research questions (Punch, 2009; Alexander et al, 2009). With the declaration of having no method that is free of error (Sechrest and Sidani, 1995), Sale et al (2002) confirmed complementarity to be the solution for quantitative-qualitative debate, which reveals that implementing both qualitative and quantitative methods in one research is not to study the same phenomenon, but different ones. Combining the results of the two phenomena will enhance the understanding of the whole situation. Furthermore, the diversity of views supported by collaborating data collected by both qualitative and quantitative instruments validates the obtained results and increases their credibility (Bryman, 2006; Greene, 2007).

Premise	Bryman (2006)	Creswell (2007)	Tashakkori & Teddlie (2003)	Greene et al. (1989)
Triangulation	✓	✓		✓
Offset	✓	✓		
Completeness	✓	✓	✓	✓
Different research questions	✓	✓	✓	
Explanation	✓			✓
Sampling	✓			
Credibility	✓	✓		
Illustration	✓			
Diversity of views	✓	✓	✓	

Table 3: The purposes of implementing mixed methods

Approaching mixed methods research embeds some difficulties, especially for young researchers such as; time consuming, knowledge and experience required in both research traditions although it helps obtaining robust and complement results (Johnson and Onwuegbuzie, 2004; Alexander et al, 2009). In the same way, Rossman and Wilson (1985) argued that approaching different methods in one study contributes to the understanding of phenomenon either by corroborate, elaborate, or initiate findings.

The context of this research did not allow choosing between quantitative or qualitative, both were necessary to answer research questions and gave a comprehensive view. This research implemented both qualitative and quantitative research types in a sequential mixed methods approach. The quantitative phase of the research "reported the reality" (Silverman, 2000:2) in forms of facts and numbers about the historians' real preference for using historical sources in their original or digital formats, while the qualitative phase helped in seeking more detailed information (Mertens, 2005) and enabled historians to express and make sense of their experiences (Lyons and Coyle 2007; Carey, 2009) by digging deep in the historians' information needs and seeking behaviour when interacting with IRS of digitised sources. The idea is that things learned using quantitative techniques helped in understanding the research context, establishing consistency and defining the research problem that was further investigated using qualitative techniques. This also assisted the initial sampling of the qualitative phase.

Quantitative research

Quantitative research is a type of query that precisely concerns the measurement of the social world that is presented in form of percentages, statistics or probability values (King and Horrocks, 2010). The major characters of qualitative research concern the aspects of deduction, prediction, testing, confirmation, generalisation, and explanation (Johnson and Onwuegbuzie, 2004). Survey method was adopted to approach this quantitative phase of research. De Vaus (2002: 5) defined survey as a "method of collecting, organising, and analysing data", and according to him data can be collected using qualitative or quantitative techniques such as; questionnaire, interviews, observation or content analysis. Meanwhile,

Creswell (2003: 153) associated survey with the quantitative type of research inquiry that yields a "numeric description of trends, attitudes, or opinions of a population by studying a sample of that population". In approaching survey method; questionnaire was used to collect quantitative data about the historians' preference for sources.

Questionnaire

Questionnaire is the most common technique to collect data in survey method (De Vaus, 2002). An online questionnaire was used to obtain facts about the historians' preference for using original or digitised primary sources. Using questionnaire helped achieving three vital aspects: reaching large community, ensuring the anonymity of participants, adding that it is a low cost method of collecting data (Simmons, 2009; Oppenheim, 1992; Pickard, 2007). Questionnaire was getting ahead throughout these processes:

- Determining questionnaire's goals and participants;
- Generating questions and constructing questionnaire form;
- Piloting questionnaire;
- Administrating questionnaire's forms; and
- Analysing the collected data and representing it.

Following, these five processes are addressed in details in the light of research's context and problem.

Goals and participants

This questionnaire aimed to assess the information needs of historians working with both original and digitised historical primary sources, primarily to know which format historians prefer most along with the reasons beyond this. Historical post-graduate students, researchers and scholars were selected to participate in this research to achieve the diversity of respondents in terms of experience, interest and age. Concerning the diversity of participants was challenging in terms of finding the appropriate method to locate and contact them. For this reason, choosing participant restricted again to the institutions that are active

in historical research and at the same time are easy to contact like universities. More details about participants are explained thoroughly in the sampling section.

Designing questionnaire

This questionnaire was conducted in an attempt to be consistent with previous studies that used similar methods. Some aspects of Duff's questionnaire (Duff et al, 2004 b) were reflected in designing this questionnaire for comparison purposes. The questionnaire was undertaken to find out whether the information needs of historians has been changed since 2004. Especially that IT nowadays has reached a very advanced level, and consequently how this affects the historians' attitudes towards digitised sources. Furthermore, Duff et al (2004a, b) carried out her research in Canada and it was interesting to find out whether the information needs of historians can be different according to time and context.

Questions were constructed based on reviewing the literature conducted in the same area and to fit with the aims articulated previously. Both open and closed question types were adopted in generating questions. Closed questions were constructed to help obtaining clear and short answers by ticking the appropriate box, Yes/No, or sometimes by ranking the given options. This type of question is easy and quick to answer (Oppenheim, 1992: 115; De Vaus, 2002; Fife-Schaw, 2006; Simmons, 2009); however, there is a risk of giving false opinions (De Vaus, 2002; Simmons, 2009), especially when options are limited.

Open-ended questions were constructed to give participants the chance to express their perspectives (Oppenheim, 1992), and to avoid giving them ready answers. It is important for participants when they are trying to articulate their needs not to have ready answers because they do tend to tick all the given options (Nicholas, 2000). In turn, open questions could provide vague answers (Simmons, 2009), adding the risk of getting the open questions unanswered because they consume lots of time (Oppenheim, 1992; Simmons, 2009). Sometimes respondents are reluctant to answer open questions especially if there are many of them.

In designing this questionnaire; questions orders had been carefully considered, especially that both open and closed types were used, and simple types of instructions were provided to guide participants. Closed and general questions were placed first in order not to make participant feel bored when starting with open questions, which may cause them to withdraw from the beginning. The questionnaire (see appendix 2) consists of four sections:

- Introduction to explain the aims of the questionnaire and ensure the anonymity and confidentiality of participants. The researcher thanked participant in advance and provided her contact details in case of having any query about the questionnaire;
- Section A was about demographic data, research interest and research sources. This section consists of easy-to-answer questions on background information that puts the respondents at ease and so they are more ready to answer the substantial questions coming in the next section;
- Section B was about historical sources' preferred format (originals or digitised) and challenged faced by historians when using original primary sources;
- Section C was devoted to evaluate the IRS of digitised sources asking about the trustworthy of digitised sources, usability of IRS that historians used, and their recommendation for better retrieval system.

In designing the questionnaire, particular attention was paid to ask for the information that is relevant to historians and formulating questions in a clear and simple way.

Piloting questionnaire

After designing the questionnaire, a pilot study was conducted in the Department of History at the University of Huddersfield. The questionnaire was sent to five history scholars by e-mail to test how comprehensive and clear the questions were, and to check how much time was taken to complete the questionnaire. Questions were then modified in the light of feedbacks gained from the pilot study, which revealed the need to cut down the open questions in order to cultivate the chance of having more responses. For example, open questions that were intended to evaluate the IRS of digitised sources, systems' usability and historians' recommendations for better system were deleted from the questionnaire especially that a qualitative research was coming next where these open questions can be asked. Why

questions were kept to give historians the opportunity to justify some answers. During the pilot study, a list of universities and historical institutions, and historical websites were contacted by e-mail to acquire their permission to distribute this research questionnaire.

Sampling questionnaire

This questionnaire was distributed to the population of historians who worked with original and digitised primary sources in the UK. In this context, probability sampling technique has been avoided because it seemed impractical (De Vaus, 2002) and required many preparations that were difficult to achieve in limited time, adding that results were quickly needed (Bryman, 2008). Non-probability method (Doherty, 1994; Guo and Hussey, 2004) was appropriate because "sampling frames were unavailable" and questionnaire was conducted in a preliminary stage of the research (De vaus, 2002: 90). Convenience sampling (Fink, 2006) was approached where it was based on convenience and volunteering elements in choosing participants. Especially, that the questionnaire was not the only used technique; and collected data were used to establish for a second robust phase. Even though drawing this sample depended on the opportunity of obtaining permission and consent, the diversity of institutions and their good rank were well considered.

Initially, a list of 88 universities ranked first in the UK in the subject of history was chosen from The Complete University Guide (2010) as an attempt to achieve both the quality and diversity of staff. Meanwhile, the National Archive in London, and the British History Online (Institution of Historical Research) were also selected under the self-belief that most (if not all) historians have accounts in one of these institutions. Permission to distribute the questionnaire was requested via e-mails from all universities listed in the history subject table, National Archive and British History Online. A self-selected sample was achieved by 43 university and institution when they approved the distribution to their historians (staff and post graduate students). A URL for the online questionnaire was sent by e-mail to the administrative staff of universities and institutions who in turn sent it to their historians. Most of the administrative staff confirmed the distribution by e-mail. Questionnaire was distributed in April 2010 to around 1930 historian. This figure was estimated by calculating the number

of historians from universities websites along with the numbers that were indicated by the administrative staff. Reminders were emailed in May to be closed in Jun 2010 with 258 responses that stored securely in the digital repository of the University of Huddersfield.

There is a variety of reasons that caused historians to not respond to the questionnaire such as; extending their seasonal holiday, being away for research purpose, busy preparing for students' exams, or not being interested in the questionnaire. In turn, there is nothing to support the indication that the answers of non-responded historians would be different from those who answered the questionnaire.

Data analysis

Since open and closed questions were used in the questionnaire, both qualitative and quantitative analyses were approached. Data collected from closed questions were analysed by PASW Statistic 18 (SPSS) software. Whereas content analysis strategy was adopted to analyse the qualitative data obtained from open questions. The approached strategy of qualitative analysis was based on three main processes (Graneheim and Lundman, 2004):

- Preparing data and grouping responses into meaning units;
- Producing codes;
- Categorising codes and creating themes.

Responses were relatively short varied between one word and a few sentences as noticed in table (4).

Meaning unit	Code
I would rather stay at home than go to National Archive	Convenience
Convenience	Convenience
Usually most easily accessed at any time of day and from office or home, do not require special handling or require travel to distant archive which usually has restrict opening hours	Convenience
Less travelling	Convenience
Convenience and accessibility	Convenience Accessibility

Table 4: Example of qualitative analysis

This example of content analysis represents a part of the meaning group of respondents' answers when they were asked to provide reason(s) for preferring digitised sources. Producing codes was determined by the meaning of a word and sometimes a sentence, especially when the answer contains incomplete sentence. Respondents' words were used in formulating codes to be consistent with the language of historians.

Reporting results

Presenting results accurately was the final procedure of this quantitative phase. Clearly, carrying out this questionnaire to gain some explanations of historians' preference was helpful in defining the research problem that will be further explored in a second qualitative phase. Results of the questionnaire were also presented and discussed in one of the Uk's conferences.

Qualitative research

Qualitative research is a kind of query that concerns the social life of individuals or groups to explore, understand and interpret their social, behavioural or cultural experiences in which researcher is entitled to understand the whole context of the query (Miles and Huberman, 1994; Creswell, 2003, 2007). The strength of qualitative research comes from the *richness*, *holism*, and *complexity* of data collected from the natural site of a phenomenon (Miles and Huberman, 1994: 10). Producing facts is not strength of quantitative research because fact is silent, and all data need to be interpreted in a way that explains the phenomenon or the situation (Gillham, 2005). What contrast qualitative research from the quantitative one is the diversity that can be noticed in research's paradigm, approaches, and methods of data collection and analysis (Punch, 2009). In qualitative research there were five main approaches to choose from (table 5).

Research Approach	Objective
Narrative research	Exploring the life of an individuals
Phenomenology	Understanding the essence of the experience
Grounded theory	Developing a theory grounded in data from the field
Ethnography	Describing and interpreting a culture-sharing group
Case study	Developing an in-depth description and analysis of a case or multiple cases

Table 5: The five approaches in qualitative research (Creswell, 2007: 78)

From the approaches suggested by Creswell (2007); grounded theory was adopted as a research strategy. Despite the fact that the procedures of grounded theory are time consuming (Backman and Kyngas, 1999; Goulding, 1999) and may not be easy for novice researchers, grounded theory was chosen because the literature was very poor regarding the IRS of digitised primary sources. Also because grounded theory is a flexible and practical research approach (Punch, 2009) that enables researchers to stay in the field of the study till satisfying all the research questions that may emerge further. By this, a fully and deep understanding of the historians' experiences was gained. Essentially, grounded theory facilitates the generation of the theory that fits the research area and indicates useful strategies (Glazer and Strauss, 1967) for developments in the area.

Results from the survey research helped in defining research problem and initial sampling for grounded theory that investigated a new phenomenon, which is enhancing the IRS of digitised sources to stimulate the creativity of historians by understanding their ISB when using digitised primary sources. Investigating the ISB of historians started from a broad context to be narrowed down as query required; focusing by that on the emerging issues.

Grounded theory

Grounded theory was only existed 45 years ago and currently it is the most popular approach in the qualitative research area (Bryant and Charmaz, 2007; Gibbs, 2002). Grounded theory as identified by its fathers is "the discovery of theory from data systematically obtained from social research" (Glaser and Strauss, 1967: 2). Clearly, the word *discovery* reveals the originality of the phenomenon conducted in the social research. In another word, the emphasis here is on the inductive building of a theory, not testing existing ones, in the areas that is still somewhat vague in the literature, otherwise to present a new view of the current knowledge (Goulding, 1999, 2002). This informs that creativity is an essential feature of the grounded theory, which is parallel with comparing and verifying the collected data to produce a rigorous theory. Another essential feature of grounded theory is the constant companion between data collection and analysis (Goulding, 1999; Glaser and Strauss, 1967; Charmaz, 2008), in addition to flexibility that provides researchers the ability to stay in the study domain till answering all questions that may emerge (Goulding, 1999; Charmaz, 2006, 2008).

Grounded theory was first developed in 1967 with the publication of *The Discovery of Grounded Theory* by Barney Glaser and Anselm Strauss; the American sociologists who have different research backgrounds; where Glaser was taught to be quantitative researcher and Strauss was qualified to be a qualitative researcher. Having different backgrounds helped in developing grounded theory, yet in turn this caused them to approach different trends (Cooney, 2010).

This division was seen by Bryant and Charmaz (2007) as a significant breakthrough in the development of grounded theory that started from 1980s. Since that, grounded theory was widely applied in different fields, and influenced by researchers' philosophical perspectives to see that even the original founders of grounded theory approach are no longer having the same attitudes. Glaser remained more faithful to the original approach, while Strauss continued developing grounded theory with Juliet Corbin. Glaser extended the work in terms of theoretical sampling and coding (1978; 1992) and now he has an official website of classical grounded theory http://www.groundedtheory.com/ and an open access *international journal of Grounded Theory Review*.

Strauss developed his approach with Corbin regarding the analytical techniques of data analysis to guide researchers (1990, 2008); more than concerning it as a comparative method (Charmaz, 2006). Glaser (1992) claimed that Strauss went too far from the original version and his approach is no longer a grounded theory because their analytical procedures force data into preconceived categories and the final product is a conceptual description, but not a grounded theory.

A new trend of grounded theory was also developed by Charmaz (2000, 2006, 2008) denoting the construction of grounded theory in which the concern is on the phenomenon under study, and theory is constructed by the interaction between researcher and participants. Constructivist grounded theory approves the influence of researcher on research, takes in

consideration multiple realities, and does not accept the statement that prior knowledge of researcher could be left behind when constructing theory (Charmaz and Bryant, 2011). Again Glaser (2002) disapproved the constructivist grounded theory; claiming that Charmaz remodelled grounded theory into a kind of qualitative data analysis where he asserted the generation of theory and the minimisation of researcher bias.

Charmaz (2006) distinguished between Strauss, Glaser, and her trend in approaching grounded theory as illustrated in table 6:

Theory version	Philosophical view	Key emphasis
Glaser	Positivism	Analytical procedures Comparative methods Conceptual development Unbiased observer Discover theory
Strauss	Interpretivism	Meaning , action, and process
Charmaz	Constructivism	Phenomenon

Table 6: Versions of grounded theory (adopted from Charmaz 2006)

Glaser and Strauss (1967) did not clarify the philosophical view of grounded theory in the original text; until Strauss and Corbin (2008) did in the third edition of their book *Basics of Qualitative Research*. Strauss and Corbin (2008) rooted their grounded theory, especially for Strauss, in the pragmatic philosophy (Bryant, 2009), yet with a lean towards constructivism from the perspective of Corbin herself (Strauss and Corbin, 2008). Considering Strauss and Corbin's definition of grounded theory "building theory from data" (Strauss and Corbin, 2008:1); they replaced the term *discovering* in the initial definition (Glazer and Strauss, 1967: 2) with *building*, which indicates their philosophical change towards constructivism. Annells

(1996) located the Glaserian version into the post-positivist, while the Straussian one was evolving towards the constructivism. Charmaz (2008) emphasised that grounded theory in the 21 century is developing in the context of constructivism.

The main difference between Strauss and Glaser versions of grounded theory is methodologically rooted (Mansourian, 2006) in the way of analysing data (Heath and Cowley 2004; Cooney, 2010). According to Heath and Cowley (2004) Glaser emphasised the induction, while Strauss gave more emphasis to deduction and validation.

Despite the fact that grounded theory had been split into different versions, they are still, according to Tan (2010), sharing these common elements:

- Theory is mainly emergent from empirical data;

- Theory is generated through the constant comparison method;

- Memo writing, formulation and revision of theory throughout the research process;

- The research process is flexible and creative.

This study adopted Strauss and Corbin's version of grounded theory for the reasons explained in next section.

Selecting grounded theory version:

Grounded theory was first developed in the field of sociology to understand society and individuals related issues; however, it is currently applied in various disciplines (Goulding, 2005) of research including IS (Matavire and Brown, 2008). In analysing the use of grounded theory in the literature of IS, it was very common to use the analysis techniques or strategies of grounded theory without approaching a specific version, while the version of Strauss came second in use and Glaser's last (Matavire and Brown, 2008). The Straussian version of grounded theory was selected not only because its popularity in the area of IS, rather it was seen to be useful and fit the specification of this study for the following reasons:

- The philosophical assumptions of Straussian grounded theory fit the current thinking of pragmatism (Strauss and Corbin, 2008);
- It concerns the environmental and contextual factors that influence the phenomenon under study (macro conditions). This strategy of analysing data to present and visualise the context, process and interrelations (Strauss and Corbin, 2008) is seen to help in presenting a comprehensive picture of historians' experiences with IRS of digitised sources;
- It provides guides and techniques for data analysis not to strictly follow, but to give a good foundation for data analysis and help, especially for novice researcher, when overwhelming with data or struggling in doing the analysis;
- The use of paradigm models is considered as a useful technique to understand the process of seeking sources by historians.

The processes of grounded theory:

Grounded theory was conducted throughout different processes presented in figure (15). These processes started with collecting data using semi-structured interview with general questions that assisted gathering, as possible, rich and detailed data. Data analysis started once the first interview was transcribed, and it was approached in three types: open coding, axial coding and selective coding. During the analysis and in the different types of coding constant comparison, asking questions, and writing memos were used as analytical tools to stimulate the thinking about concepts and data.
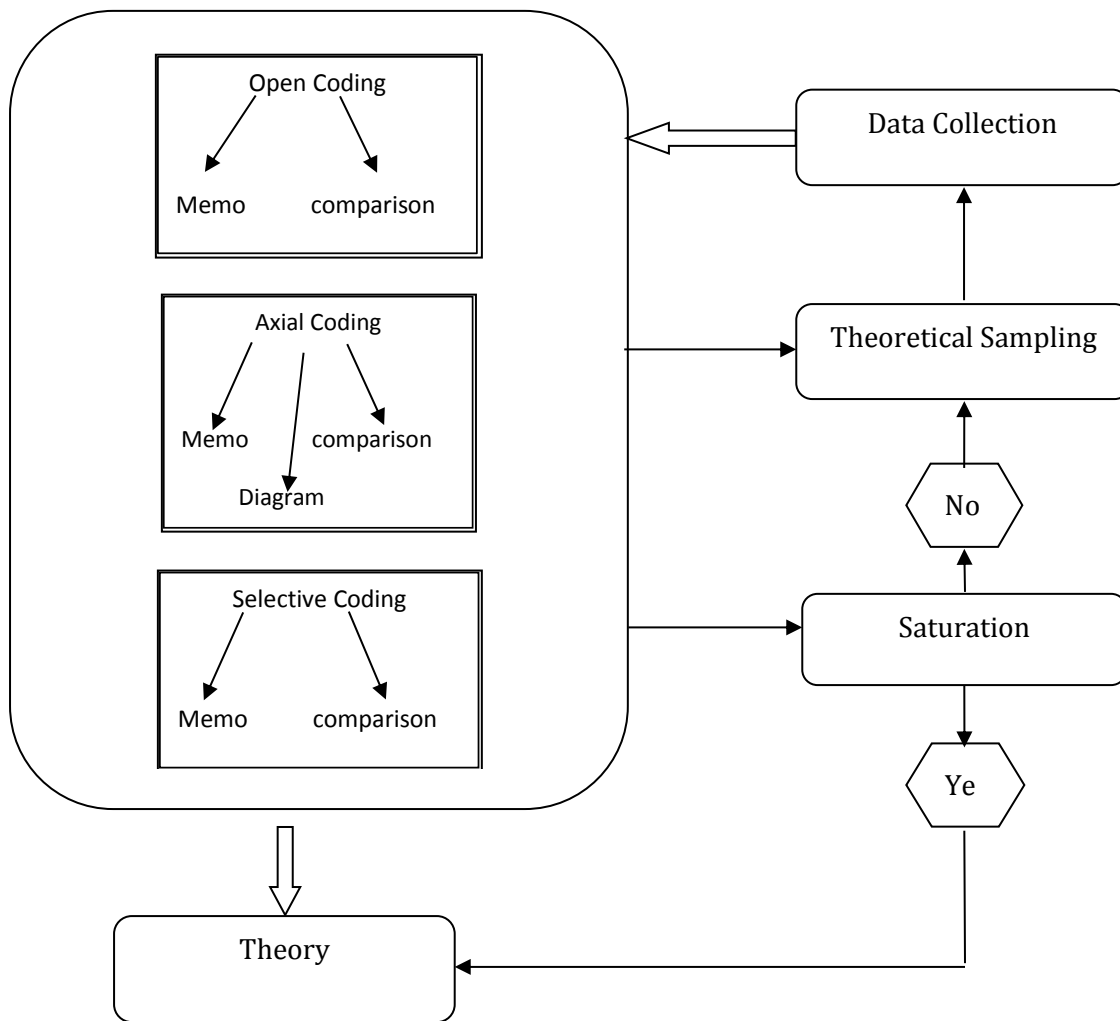
Figure 15: Processes of grounded theory

Sampling in grounded theory was guided by data analysis to develop categories, properties and their relationships. Analysis, sampling and data collection were supposed to continue until achieving saturation, developing the core category, and building theory.

Sampling for grounded theory:

In qualitative research, techniques of sampling are different from what is approached in quantitative research because the concern in qualitative sampling is not to represent the larger population and generalise findings, yet it concerns the understanding of phenomenon by looking for concepts and their variations (Corbin and Strauss, 2008). Theoretical sampling contributes to the strength of grounded theory (Charmaz and Bryant, 2011); it is considered

to be in the heart of grounded theory and is defined as "a method of data collection based on concepts/themes derived from data" (Corbin and Strauss, 2008: 143).

This facilitates the flexibility in collecting data in order to develop the property of concepts and categories and allocate the relationships between them until the saturation is achieved (Corbin and Strauss, 2008; Charmaz, 2006; Goulding 2002). Theoretical sampling can be applied in the first stage of collecting data (Charmaz, 2006); however, principally it is up to the researcher's sensitivity from where to start and what serves best. This initial sampling is open (Hodkinson, 2009) and purposeful (Coyne, 1997) in which selecting the first cases is guided by the researchers' desire to gain rich information. The next sampling is theoretical where is triggered by collected data. Procedures of theoretical sampling vary according to coding type (Strauss and Corbin, 1990); where in open coding researcher are more open to gather, as possible, all the relevant information. In axial coding, where categories are defined, the sampling is more "rational and variational" guided to discover more relationships between categories as well as to validate these relationships. In selective coding, sampling is "discriminate" and very much directed to develop poor categories and validate the relationships until saturation is achieved in terms of relevant collected data, developed categories and well established relationships between categories (Strauss and Corbin, 1990).

In grounded theory sampling (table 7) was approached sequentially (Draucker et al, 2007) started with initial purposeful sampling and moved to theoretical sampling (Charmaz, 2006) where the emerged categories and concepts decided which method to use? What questions to ask further? Where and who to interview next?

The opening sample was selected in the lights of the results gained from online questionnaire conducted in the first quantitative phase of this study. Since the age of historians was proved to affect their decision about the usefulness of original or digitised sources, the initial sample was selected from the younger generations of historians. The purpose of this selection was to obtain as much information as possible about searching and dealing with original sources and

particularly the digitised ones. Accordingly, four face-to-face semi-structured interviews were conducted with historian PhD students. There were three males and one female in which two of them were teaching history and doing research.

Sample	Reasoning	Case	Method	Number
Opening	Obtain general information	PhD students 3 males 1 female	Face-to-face semi-structured interview	4
Rational	Direct the data collection to more experienced cases to obtain deeper information to develop categories and concepts	Doctors and Professors 1 female 6 males	E-mail interview	7
discriminate	To verify the story drawn from previous data and to rest the relationships between the categories that constructs the story	PhD students Professors Doctors 5 males 3 females	6 face-to-face semi-structured interview 1 telephone interview 1 e-mail interview	8

Table 7: The processes of theoretical sampling

Data collected from the first round of interviews were helpful as a start point where general information was acquired in terms of information needs, seeking behaviour of primary sources and creativity. In this stage emerged the need to gather more information about creativity to bring more development to the concepts and categories of creativity. Interviewees sometimes were unsure in expressing themselves in terms of creativity and how to stimulate it through their research, in which one of the interviewees suggested that this question about creativity should be asked to his supervisor:

"You would need to speak to one of my supervisors I think" Dave, male PhD student.

Accordingly the next sample was directed to interview experienced historians (doctors, professors) approaching another method of interviews. E-mail interview was used mainly to save time during the seasonal holiday (rationale of using email interviews and procedures are discussed in the next section of data collection). The main focus of this stage was on creativity; trying to acquire deep information and various insights in order to enhance the dimensions of categories. To achieve this, questions were sent via e-mails to historians in three different universities (Leeds, Manchester, and Reading). There were six males and only one female; five of them were doctors and two were professors.

Despite the fact that conducting interviews using e-mail method was quick, convenient and helpful in terms of variety of perceptions about creativity (Lowndes, 2005), data were relatively brief and lacking some kind of details that could give richness and insights to the analysis. This revealed the need to do more face-to-face interviews to verify the story drawn from previous collected data.

Coding and analysing the data, collected from the first two stages of interviewing, guided the sampling towards participants from different professional statues; especially that age does always indicate the length of experience or professional status correctly. For instance, a 40 year-old historian can be a professor, while in another case he/she can be a PHD student. In a view of this, the last discriminate sampling was approached to interview eight more historians in which three of them were female and five were male. Regarding their profession, there were three PhD students, three professors, and two doctors. All professors and doctors were teaching at the university and supervising research students except for one Doctor who was recently graduated. It was essential to interview historians from different profession status to be consistent with previous cases as well as to ensure a variety of insights reflected by historians' occupations and experiences.

The focus in this stage was on creativity and the ways of stimulating it when interacting with IRS of digitised sources to verify the relationships between developing the IRS of digitised

sources and the creativity of historians. Data were collected using six face-to-face semi-structured interviews, one e-mail interview because the participant was away in Canada for a research purpose, and another telephone interview.

Data from this set of interviews came to confirm the story told by earlier interviewees, and validate the relationships between the core category and others that together construct the context of the phenomenon. This stage was the final one in theoretical sampling because what was discovered during the analysis came in line with previous categories and concepts and no new queries did emerge for further investigations. Theoretical saturation was achieved because categories were developed and relationships between them were also verified, and story was contextualised regarding the factors that may affect the phenomenon.

Clearly, theoretical sampling is not just about the size of sample or how much data were collected and analysed because it is possible that a researcher can continue collecting data for very long (Corbin and Strauss, 2008), it is about reaching the saturation in developing categories and understanding the relationships between them to assist the construction of the theory that tells the story embedded in data.

Data collection method: interview

Interview is a "controlled interaction" (Keats, 2000: 5) that results in rich and detailed data (Bryman, 2008; Pickard, 2007; May, 2001, Smith, 1995; Breakwell, 1990), which are helpful in understanding the individuals' experience, feeling and attitudes. Interview allows the interaction between interviewee and the researcher (Punch, 2009). Flexibility of interview is one of the important characters that attract qualitative researchers (Bryman, 2008; Charmaz, 2002; Banister et al, 1994). Mason (1996) argued that in qualitative interviewing researchers do not collect data; rather they generate data and construct knowledge from chosen sources. Qualitative interviewing was approached because of the interest in the subjective meaning (Banister et al, 1994) of historians' experiences. In reality, people's experiences are not similar and understanding these differences contributes to the whole picture, and visualises

the dimensions of the phenomenon. Interviewing informally helps people's thoughts, feelings, or attitudes to speak out (Mason, 1996) because they normally like doing conversations more than answering formal questions. Exploring the silent thoughts along with the diversity of experiences were the primary drivers to approach qualitative interviewing.

Interview varies in type between structured, semi-structured and unstructured. Structured interview consists of a set of questions defined in advance, and is often used to generate quantitative data (May, 2001; Whiting, 2008). Semi-structured interview is similar to a conversation with people where researcher guides and controls the conversation (Moore and Phillips, 2002), whereas unstructured interview is mostly used in telling life story that allows interviewees to speak in their terms, languages and preference (May, 2001). Unstructured interview is directed by the story of interviewee (Gillham, 2005) in which questions are emerged and asked by interviewer to clarify situations or explore more details.

In this study, semi-structured interview was used because of its flexibility that helped in achieving the balance between the talk of historians and the context of the study. This type of interview consisted of specific topics or a set of questions scheduled around specific topics that called interview guide to help the researcher directing the interview. In turn, this type of interview enabled historians to express their ideas and make sense of their experiences in a flexible context (Bryman, 2008; Gillham, 2005; Smith, 1995). Smith (1995) distinguished semi-structured interview from other types of interview with a set of characters:

- Establishing rapport with interviewee;
- Questions can be asked in any order according to the flow of the dialogue;
- Questioning the raising areas of interest;
- Following the interest of interviewee.

These characters of semi-structured interview contribute to the generation of rich data that help understanding the experiences of interviewee. Semi-structured interview was carried

out by three methods: face-to-face, e-mail, and telephone. Each method is explained in details in terms of reasoning and procedures.

Face-to-face semi-structured interview

Face-to-face semi-structured interview is considered to be a costly method of collecting qualitative data (Bryman, 2008; Gillham, 2005; Breakwell, 1990) because it requires many preparations and often involves travelling to different locations (Opdenakker, 2006), adding that it is time consuming regarding the arrangement for the event, transcription, and data analysis (Smith, 1995). Arranging a face-to-face interview embedded some delay to the research processes because it took time to agree on a convenient date for interviewee (academic historians) who scheduled their time for the whole term in advance. Despite the embedded difficulties in doing face-to-face interview, it is still very helpful in terms of both verbal and visual interaction with interviewee (Opdenakker, 2006; Frey and Oishi, 1995). Face-to-face interview gives many advantages regarding social cues like the tone of the voice, face expression and body language (Opdenakker, 2006). Adding that the interaction in face-to-face interview is spontaneous where answering questions is direct and immediate after asking them (Opdenakker, 2006). In face-to-face interview, it was noticeable that the interest of interviewees was easily promoted because of the instant interaction.

Face-to-face semi-structured interview was carried out through these stages:

- Defining the needs of interview and developing an interview guide;
- Piloting interview;
- Preparing for interview;
- Interviewing; and
- Closing interview and transcription.

Interview guide

The focus of interview is normally built upon the researcher experience or literature review (King and Horrocks, 2010). In this case literature review was excluded because of approaching grounded theory where reviewing literature is not very recommended to reduce

the influence of preconceptions on analysis (Charmaz, 2006; Corbin and Strauss, 2008). Avoiding literature review is not always applicable and some reviews are needed to orient the research (Punch, 2009), especially in academic research where originality is required. The results of questionnaire, conducted in the first quantitative phase of this research, gave some insights about the information needs of historians and helped in defining the key areas for interviewing, though the initial interview was meant to be general in order re-listen to historians talking about their information needs in a narrative style.

Open-ended questions in semi-structured interviews were constructed to gain general information about historians' experiences with historical primary sources, and how they perform their research and deal with digitised sources. To define the information needs of semi-structured interview (table 8); these questions were asked: what is needed to be known? And what is expected to be known? Accordingly, the main areas were defined along with a set of issues to be addressed later in the interview guide.

Main area	Addressed issues
Information needs	- Needs of doing historical research - Needs of using original sources - Needs of using digitised sources
Information-seeking Behaviour	- How to seek original sources - How to seek digitised sources
Creativity	- Strategies of stimulating creativity
IRS of digitised sources	- Ideal components of IRS

Table 8: Information needs of semi-structured interview

Interview guide (Appendix 3) was developed to cover these issues in which questions that asked about the first two areas (information needs and seeking behaviour) provided an entry to the subject of creativity and how it may be stimulated through seeking behaviour to end

with the last area about IRS of digitised sources. Historians were invited to talk about what is missing in the current system and how to develop it. The interview guide was constructed in an open way to ask about experience, behaviour and opinions of historians. It consisted of four main sections, and each one consisted of a set of questions, and phrases that helped proposing questions. It was essential to consider a plan (B) for some questions that may seem complex (information box 1).

Box 1

Plan A

- What are the information needs that can be only satisfied by using original sources?

Plan B

- In which situation did you feel that you needed to use only original sources?

Probes also were included in some questions (information box 2) to help proposing further question and further investigate the answer of interviewee (King and Horrocks, 2010; Gillham, 2005).

Box 2

Inviting you to think of:

- What is missing in the current IRS in an attempt to enhance this system?

Probes:

- Type of access
- Meta data
- Training

It was also important to make sure that questions were not repeated and to check that each question was distinct from the other (Gillham, 2005). Adding to that, Breakwell (1990) stated some guidelines to construct questions such as avoiding: the leading questions, the use of complex jargons, assuming thing that are not discussed or including double negative in one question. The way of constructing questions were more focused in later interview guide when e-mail and face-to-face interviews were conducted again, as analysis entailed.

Piloting interview

The interview guide was tested with one historian (PhD student) from the University of Huddersfield. Initially, a PhD student was sent an email explaining the aim of the study and requesting his/her participation. Once agreement obtained, information sheet and consent form were sent to the interviewee by e-mail. The interview took place in the university and lasted for 45 minutes and recorded using a digital audio recorder.

Gillham (2005) defined the needs of piloting study in changing the questions' wording, focus or order, and removing or replacing questions. Piloting interview did not test questions only, yet all the procedures of conducting interview starting from contacting historians and introducing the study, arranging date and place, the suitability of the place, communication of the researcher and recording equipment. Interviewee was told from the beginning that the primary aim of the interview was to test the questions of the interview in terms of fluent, wording and clarity of questions' format, adding the comprehensiveness of areas covered by the questions. This allowed the interviewee to comment on questions or asking for clarifications whenever this was required to assist any modifications.

The piloting went well and the interview yielded rich data, therefore this interview was included in the analysis. Feedback was received about clarity of questions and the interviewee appreciated the time that had been given after each question to think before answering because some questions required that, and he suggested sending questions in advance to interviewees because some questions need more thinking or preparing for them. Accordingly,

an interview guide was created for interviewees to be sent in advance along with the information sheet and consent form.

Preparing for interview

This phase included inviting historians for participation in the study, contacting historians who agreed to participate and arranging for the interview's date and place. Initially, an invitation letter was sent to all PhD students, the rationale of this selection was discussed previously in sampling, via the head of the History Department in the University of Huddersfield; introducing the researcher and giving general description of the research goal. Four historians responded to the e-mail expressing their willing to participate in the research.

According to this, the researcher contacted those historians thanking them for being able to participate in the research via e-mail. Historians received the sources related to interview, information sheet, consent form (discussed later in the ethical issues) and interview questions. Historians were asked to state their time availability to arrange for the date of the interview. It was agreed from all historians to carry out the interviews in the university, thus it was arranged with the school office to book a quiet room for this research purpose based on dates assigned by historians. Some interviews rescheduled due to issues related to interviewees.

Regarding the place of the interview, it was considered to book a quiet room where the school office advised to book room in the upper floor away from the lecture rooms. Historians were provided with the researcher's mobile phone number for directions; in case they experienced any difficulties in finding the interview room.

Interviewing

It is now the time for the main event which is interviewing. The first five minutes were assigned to introduce the researcher and the interview topic to establish a shared background with interviewees and answer any questions they may have. This short introduction along

with providing some refreshment (tea, coffee, water), supplied by the researcher; helped in establishing a friendly environment before starting the questions. Interviewees signed the consent form after reading it, thus they were aware of rights and declarations stated in the form.

Before asking questions, permission from interviewees was requested to run the recorder. A special care was paid to the issue of recording to avoid any risks (King and Horrocks, 2010; Gillham, 2005) where the digital recorder was tested for fifty seconds to check its functionality, and making sure that spare batteries were always available. The average length of interviews was 45 – 60 minutes and they were audio recorded in mp3 file format. During the interview, notes were also taken whenever this was applicable. In this research, twelve face-to-face semi-structured interviews, as presented in sampling section, were conducted in two phases.

Closing interview and transcription

Upon finishing all questions, interviewees were asked if they wanted to talk about any missing issues related to the discussed areas. If there was nothing to add, the researcher would end the interview by thanking the interviewees and showing appreciation for taking part in this study (Keats, 2000). After that an e-mail was sent to historians thanking their participation, sometimes asking for personal information if required, and encouraging them to contact the researcher if further information was needed regarding their participations.

The next task was transcribing the audio records into texts and preparing data for analysis. Transcription was a very "slow business" (Breakwell, 1990: 85) and consumed lots of time (King and Horrocks, 2010). The first three interviews were transcribed word-by-word by the researcher, which took a long time to accomplish. Transcribing interviews by the researcher helped in understanding the contents of the interview very well; though seeking a professional help was required especially when considering time as a critical factor in doing research. Therefore the rest of the interviews were done by a professional. It was essential to

make the transcriber aware of and respect the confidentiality issues of the data (King and Horrocks, 2010). The transcription was done word-by-word and there was no concern to know the duration of the silence during the talk. The researcher paid more attention to check the accuracy of transcriptions by reading the transcripts and listening to the interview records at the same time.

E-mail Interview

Currently, e-mail can be considered as the most used interaction method, which helps generating qualitative data from people in remote places. King and Horrocks (2010) justified the popularity of e-mail interview to its availability, being easy and familiar to use, in addition to the possibility of reaching participant all over the world. E-mail interview is a very flexible and convenient method for participants who can respond in their free time (James, 2007; James and Busher, 2006; Bampton and Cowton, 2002). It saves the researcher time because it does not require many preparations as in the face-to-face interview, and transcription is not required (Lowndes, 2005). E-mail interview is a non-costly method and preferred by some participants, especially when discussing sensitive issues, adding that it helps avoiding any errors in transcription, and collected data are focused and respondents have enough time to think about answers (Meho, 2006; James and Busher, 2006; Opdenakker, 2006). In turn, responses in e-mail interview may be brief (Lowndes, 2005) and the risk of ignoring e-mail or dropping out before completing the interview are considered to be common problems (King and Horrocks, 2010; Meho, 2006; Lowndes, 2005). Another disadvantage of e-mail interview is that the instant interaction between researcher and interviewees is not supported (King and Horrocks, 2010).

The primary aim of carrying out an e-mail interview was saving time during the seasonal holiday and gaining rich data from experienced historians by reaching diversity of participants regardless of their geographical locations. Time was a critical factor in this qualitative phase of the research, because involving people in research embedded some difficulties in arranging interviews at their convenience, which sometimes caused to delay interview several times.

The process of e-mail interview

Initially, an invitation letter was sent by e-mail to academic historians in three different universities; introducing the research topic and inviting them to participate in the research by taking part in e-mail interview. Contact details of historians were taken from universities' web sites. Positive responses were received from ten historians expressing their willing to participate.

Consequently, information sheet and consent form were sent to historians along with four questions concerning creativity. Questions in e-mail interview (appendix 4) were meant to be very focused on the area of creativity as the analysis of the first set of interviews entitled more investigation about the meaning of creativity in the historical context, and the strategies of stimulating creativity through seeking behaviour and interacting with IRS of digitised sources. Questions of the e-mail interview were tested with one historian and developed in the light of acquired feedback.

Participants were informed to answer questions at their convenient, for instance they may answer two questions at a time in each e-mail. They were also advised that the time scale for this interview was one month. Some participants were quick in sending responses, while a reminder was sent to those who did not respond after two weeks, and then by the end of the time scale. Unfortunately three historians ignored answering question from the beginning. All responses were read in depth to generate other questions to further investigate or clarify the discussed issues. Thus, these questions were sent again to participants via e-mils. Answers were received and no questions emerged from these data revealing the end of the e-mail interview, and then sending a thank you e-mail. It was also essential to check that all participants read and signed the consent form. In the thanking e-mail, the researcher was grateful for participants; appreciating their time and efforts devoted to help in this research.

Telephone interview

Telephone interview is one of the common distance methods of collecting qualitative data due to the high availability of this communication method and the possibility of reaching participants wherever they are, so geographical location is not restricting the interview (Sturges and Hanrahan, 2004; Opdenakker, 2006; Gillham, 2005). Comparing to other interviewing methods, telephone interview is effective in terms of cost, speed (Frey and Oishi, 1995) and privacy, especially in sensitive topics (Sturges and Hanrahan, 2004). In telephone interview, synchronous of time supports the spontaneous interaction; where researcher has the ability to clarify situations and use probes instantly when applicable (Opdenakker, 2006; Gillham, 2005). It is applicable that the tone of the interviewee' voice can give some clues about the situation (Gillham, 2005), yet the interaction medium still missing the visual cues (King and Horrocks, 2010; Opdenakker, 2006; Gillham, 2005).

Semi-structured interview was conducted by telephone only for one time due to the difficulty in reaching the interviewee. The participant was originally contacted by e-mail to take part in the face-to-face semi-structured interview and because of the difficulty in travelling; the participant suggested telephone interview and the researcher agreed to that. The arrangement for the telephone interview was carried out via e-mail where the participant received the information sheet, consent form, and questions. Similarly, time was arranged for the interview also by e-mail. The interview was recorded in an mp3 file format using a digital recorder, and then the interview was transcribed by a professional.

Practically, carrying out interviews in three different methods (face-to-face, e-mail/online, telephone) assisted the research in different ways:

- Face-to-face interviews provided detailed and rich data in the first set of interviews, because face-to-face interview allowed full and spontaneous interaction between researcher and historians. These rich and detailed data opened the investigation and led the focus to a topic that was not fully covered. Another set of face-to-face interviews was conducted at the end to verify data collected by e-mail interviews and gain more details.

- E-mail interviews provided a variety of data, which helped in gaining insights about different incidents and cases that were important to define the properties of categories. However, data collected from e-mail interviews were quite short and lacked the enriching details and social cues; therefore e-mail interviews were followed by fact-to-face ones to regain this richness of data.

- Telephone interview was used just once in the investigation and likewise face-to-face interview it provided rich data and enabled spontaneous interaction.

In a word, each method of interview assists the research in one aspect. Conducting face-to-face interview seems the appropriate method because most people like talking, as an everyday activity; however, it is time consuming when comes to transcription. Answering interview questions by e-mails helped in focusing the thoughts of historians who structured their answers in a few words or short sentences. In turn, e-mail interviews saved the time of researcher that would be spent on transcription and travelling to meet interviewees. Telephone interview is a mid-way between face-to-face and e-mail interview. It combines the advantages of being spontaneously in interaction with interviewee where verbal cues are existed, saving time; adding that it is convenient to both researcher and interviewees. The ideal practice of e-mail interview is to be followed by face-to-face interview, where the former gains variety of data by being able to conduct several interviews at the same time, while the later helps enriching data.

Data analysis

Analysis in qualitative research is the process that involves an intensive examination of data to explore what it is about by fracturing this data into various components, and examining these components to define their characters and dimensions to finally make inference about the whole object (Corbin and Strauss, 2008). Basically, qualitative analysis is grounded in the interpretative philosophy in which people interpret their experience, mainly using language, and the researcher is entitled to discover the embedded meanings to conceptually gain a holistic understanding or generate a theory (Gibbs, 2002). The object of analysis is generating the theory that tells what is in the data (Punch, 2009). Analysis is about giving meaning to data (Corbin and Strauss, 2008), which entails a constant interaction between the researcher

and data (Strauss and Corbin, 1998). Miles and Huberman (1994) defined qualitative analysis in three main activities: reducing data, displaying data, and finally verifying data and conclusion. In qualitative analysis, coding is a central activity that means naming the pieces of data, and it varies in type and level through the progress of analysis (Punch, 2009). In grounded theory, analysis starts from the first piece of collected data (Glaser and Strauss, 1967) and consists of three main types of coding (Strauss and Corbin, 1990):

- Open coding;
- Axial coding;
- Selective coding.

Strauss and Corbin (1990) stressed the issue of having no clear lines between these types of coding and the researcher can move between one type of coding and another without realising that, especially between open and axial coding that occur early in analysis. These coding types are explained sequentially along with the analytical techniques approached in each type of coding to assist the analysis. Memoing is another essential element in the analysis, which is also discussed in details in this review.

Open coding

Open coding is "the process of breaking down, examining, comparing, conceptualising, and categorising data" (Strauss and Corbin, 1990: 61). The aim of open coding is creating conceptual categories; the first level of generating theory (Punch, 2009). There are different methods of approaching open coding. Sometimes the analysis can be very detailed and done word-by-word, the smallest unit of meaning, line-by-line, incident-by-incident (Weed, 2009; Charmaz, 2006), by sentences, paragraphs, or even the whole source (Strauss and Corbin, 1990).

Open coding in this research was approached by sentences. Initially, there was an attempt to code the interview's data line-by-line, but there was a difficulty in finding any meaning in many lines, which suggested coding by sentences and sometimes by paragraphs. Coding line-

by-line is not always controlled by the researcher because it is not necessary for every line or sentence to be important or have a meaning (Charmaz, 2006). Struggling to find meaning in lines may be caused by not editing the transcripts of interview. It happened that interviewees were kind of repeating words that make no sense together trying during that to think of an answer.

Open coding was initiated by trying to label the phenomenon embedded in each incident. This process was facilitated by the use of questioning as an analytical tool that helped focusing only on data (Strauss and Corbin, 1990; Corbin and Strauss, 2008) to know what interviewees meant or which issue they were talking about. Charmaz (2006) and Punch (2009) suggested some types of questions such as:

- What is this piece of data about or telling?
- What does this piece of data suggest?
- To which category does this piece of data pertain?

Questions like: what is going on? What is this person trying to say? Helped in indicating the meaning of the data and identifying the concepts. Charmaz (2006) recommended, in open coding, the search for action in data. Lots of concepts were identified from the data, and the next step was to group them in categories. This was done by comparing incidents in order to classify similar incidents under one category. Names of categories were constructed to logically represent the included data such as; the activity or opinion that was shared by all of the incidents. Names of categories varied between one word and short phrase. Apart from this, Strauss and Corbin (1990) mentioned that categories name can be derived from the literature or from the words of the interviewees themselves.

Making comparison, another analytical tool, is considered with the use of questioning to be the core elements of analysis in grounded theory (Punch, 2009; Strauss and Corbin, 1990). Comparative analysis in open coding was performed constantly where each incident was compared with others for similarities and differences. Accordingly, similar concepts were

categorised together, and again the similar incidents were also compare with each other to discover properties and dimensions of each code. Constant comparison is a continuous activity in grounded theory analysis; not only between data and codes, yet between concepts, categories and finally with the literature to ensure that theory is generated only from collected data (Strauss and Corbin, 1990; weed, 2009). Each category was developed in terms of properties (characters) and dimension, the "location of property along a continuum" (Strauss and Corbin, 1990: 61), and written in a memo (Box 3) (see appendix 5 for more coding notes).

Box 3

Code Note: INTEREST AND ITS PROPERTIES AND DIMENSIONS 15/03/2012

Interest as a personal need of doing research has some general properties that can be varied along the dimensional continua:

General properties	Possible Dimensions	
Intensity	low	high
Duration	temporary	continuous

Interest can vary in intensity from low or normal interest to become a passion. Example:
[I became interested and much more interested in politics in the Middle East and Africa]
[I am doing the research because it is something I am very passionate about]
Also it can vary in duration from a temporary period for certain research task to a longer time or being continuous. Example:
[The research I am doing currently is based on the dissertation I did for my Master which is now 10 year ago I had a bit of break from academia]

Under condition of having an interest, historians seek sources.
Under condition of doing research for a long time, the interest is high.
 [... I think if you going to take a PhD you really need to be passionate about it because you obviously have to eat drink and sleep it for at least 3 years].

This code "interest" is one property of a "need" that motivated historians to carry on a research as presented in figure (16).
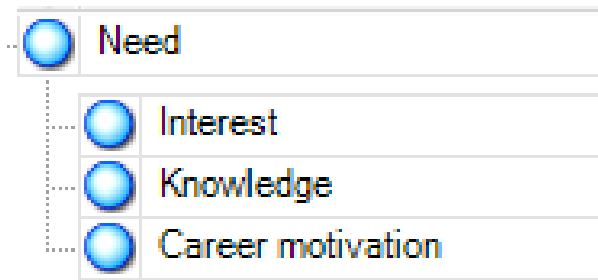
Figure 16: Screenshot of a code structure

As can be noticed, historians carried out a research driven by their interest that can be transferred into passion when interest reached a very high level. There was some confusion in choosing name for the code "interest" because initially the name was proposed to be "passion". This issue was reflected in a memo (Box 4). Another two motivations were the status of knowledge and career.

Box 4

Theoretical memo: Code name Interest vs. Passion   10/12/2011

Participants kept mentioning "interest" and "passion" as a reason of doing history and I was somehow uncertain about which one to choose as a code name. However, by examining and comparing incidents of Edward and Dave; I firstly decided "passion" as a code name to reveal their reasoning of doing historical research to finally go with "interest" as a name. Edward failed history at collage because of traditional teaching method, which was poor one and this could lead student to feel boring and losing interest. This indicates that he was passionate about history more than just interested, which indicated by him when talked about studying history at university. Dave as well said this very clearly when talked about his PhD research.

Looking at this code as a property of the code "need" suggested that it should be a general property in which "interest" fits this purpose because "passion" is considered to be an extreme state of "interest". Consequently, "passion" can be one of the variations of "interest" that can be low or high.

Figure (16) represents a basic structure of a code that consisted of a main category and sub-categories; however, in other cases the code structure was more complex to be consisted of categories, sub-categories, and their children (see appendix 6 for the full coding tree)

Axial coding

Axial coding involves the procedures that put data together again in new ways by construct relationships between categories (Strauss and Corbin, 1990). The aim of axial coding is connecting the categories generated from open coding (Punch, 2009) by the means of "coding paradigm" that consists of:

- *Casual conditions*: incidents that cause phenomenon to occur;
- *Phenomenon*: the central idea of event;
- *Context*: properties of phenomenon;
- *Intervening conditions*: incidents that facilitate or constrain the action/interaction strategies;
- *Action/interaction strategies*: that manage or respond to the phenomenon;
- *Consequences*: the results of action/interaction strategies when dealing with the phenomenon (Strauss and Corbin, 1990: 96-97).

Asking questions and making comparisons were used again in this stage of analysis to assist the interrelationships between categories (figure 17). Asking questions about category such as; what is the category? When, where, and why does it occur? What is/are the consequences of a category? (Scott, 2004; Corbin and Strauss, 2008); helped proposing the relations that a category had, and defining whether this relationship was conditional, contextual, or strategically. One category may indicate the casual conditions, consequences, or managing strategy. After proposing a relationship, there was a need to verify this hypothesis by examining the data again and searching for evidence to support this relationship. This reveals the "move between inductive and deductive thinking" (Strauss and Corbin, 1990: 111).
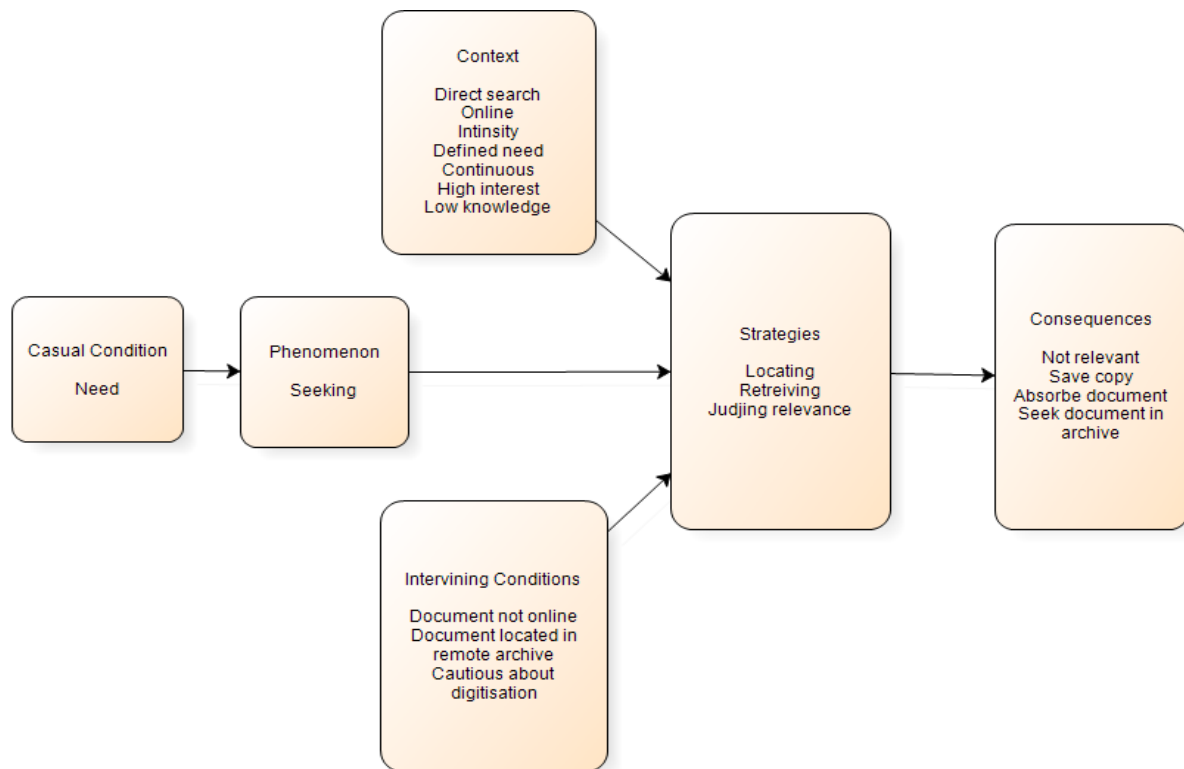
Figure 17: Coding paradigm

Figure (17) presents the relationships between "needs" that motivated historians to do research and "seeking" sources. The context of "seeking behaviour" was defined as online direct research where need was already defined, and levels of high interest and low knowledge were also existed. "Seeking" sources was managed through different strategies (locating, retrieving, and judging relevance). In this context some conditions were appeared to constrain "seeking" such as sources were not available online and they were located in remote archives where historian was entitled for travelling to fulfil his/her need; adding that some historians were cautious about digitised sources where they could only be satisfied by using originals. Consequences from performed strategies when "seeking" sources were varied for example; if source was relevant then the consequences is reading and absorbing contents or saving a copy if applicable. A consequence can be influenced by the intervening conditions for example; in the case that sources were not online, historians had to seek it in archive in which travelling, spending time and money were required.

Selective coding

Selective coding involves the process of selecting the main category, inter-relating it to other categories; along with validating and developing these relationships (Strauss and Corbin, 1990). According to Punch (2009) the object in selective coding is pulling together the developing analysis in a way that helps constructing theory that explains the data. Initially, the focus was on constructing a story line; a descriptive story. Form the analysis essential categories were emerged from the data "seeking behaviour", "stimulating creativity" and "developing IRS". The emerged issue was choosing the core category that a story would be drawn around it (box 5). This issue was challenging because at a point everything in the data seemed important (Strauss and Corbin, 1990) and choosing one core category was hard (Gibbs, 2002). Trying to answer questions like; what is the main problem? And which area seems to be the most striking? Thinking about the potential core categories and making comparison between them; contributed in defining the story line.

Box 5

Theoretical memo: Exploring the story line 07/09/2012

Which category is the main one? What is the story line that combines these various categories?

I have been thinking about this question for long. Is it "Seeking Behaviour" or "Stimulating Creativity" the core concept for my story? The former one seems very common not only for historians and there is nothing special about it; however, the issue is: when this behaviour results in a creative work? However, it is not necessary that seeking behaviour should result in a creative thing. From my experience, as an academic, what concern me in doing research or "Seeking Behaviour" is to come up with original or new participation in my field of research.

Even I am more likely to go with "Stimulating Creativity", yet more thinking is required regarding the development of IRS.

So, keep thinking…

Writing a descriptive story in a memo was useful in terms of focusing on one area and getting familiar with the core category that story was built around. Box (6) presents an initial thinking about the story line:

Box 6

Theoretical memo: Initial thinking about the story   04/10/2012

The main story seems to be about how an IRS of digitised sources could be developed in order to stimulate the creativity of historians. For historians, working with original sources is preferred, though working with digitised sources seems more convenient to them. Historians seek information and do research in order to produce an original idea. This desired production seems to be an essential driver that motivates historians to seek information and manage difficulties that they may face. Historian may plan some of these processes, while others may be directed by accidental discoveries. An IRS of digitised sources supports the creativity of historians in some aspects; however, it also limits this creativity in others. Consequently, based on the strategies approached by historians to stimulate creativity and the difficulties faced with digitised sources, different ways have been introduced to enhance an IRS of digitised sources.

Then the analysis was moved to a more conceptualising level to select the category that reflected the story line and then to develop it in terms of properties, dimensions and connections with other categories.

Theory

The final product of the analysis was theory that completely derived from data and gave insights on how to develop an IRS of digitised sources in a way/s that assist the stimulation of historians' creativity.   According to Glazer and Strauss (1967) the generated theory is required to *fit* the area in which the theory would be applied, and to be *understandabl*e from the people involved in this area, also a theory is required to achieve levels of *generality* and

control to facilitate its application. Corbin and Strauss (2008) were cautious about providing criteria for evaluating grounded theory because not all criteria are applicable to all qualitative research, in turn they presented several criteria such as; "fit, applicability, concepts, contextualisation, logic, depth, variation, creativity, sensitivity and memos" (Corbin and Strauss, 2008: 305-307). However, criteria for evaluation were adopted from Charmaz (2006) because they are more specific from those by Corbin and Strauss (2008); especially that Corbin and Strauss (2008) did refer their readers to the criteria proposed by Charmaz (2006).

Charmaz (2006: 182-183) defined four criteria for the evaluation of grounded theory study:

- *Credibility*: in which the product of grounded theory is evaluated for fitness, evidence to support claims, sufficiency of data, and the logic between data, argument, and analysis;
- *Originality*: in which the research offering new and significant insights, and a new conceptual present of data;
- *Resonance*: in which the grounded theory makes sense and understandable by people in the research area;
- *Usefulness*: in which the grounded theory contributes to the knowledge and people who are in the same context as in the research.

These criteria are revisited in the last chapter of the thesis to evaluate the results of this study.

Memos

Memos are "written records of analysis related to the formulation of theory" (Strauss and Corbin, 1990: 197). Writing memos starts from the initial stage of analysis and varies in type, content, and length according to the level of analysis (Glaser, 1978; Corbin and Strauss, 2008). Writing memos assists and promotes the analytical process (Charmaz, 2006) by writing up ideas about coding, categories and properties, and interrelationships between categories. Furthermore, using diagrams contributed in visualising the theoretical development of building a theory. Writing memos was about keeping track of researcher's thoughts about data through the whole research (Stern, 2007). They helped in identifying gapes in data and

which areas or questions to investigate further (Charmaz, 2002). The essential feature that memos offered was the ability of working with individual ideas without being restricted to the logic of these ideas (Strauss and Corbin, 1990), language, or sentence structure (Glaser, 1978; Charmaz, 2006).

Each memo was independent by itself, unless it was meant to elaborate the contents of another memo. Memo had a tile that indicates its purpose, and it was automatically dated when created by Nvivo software. Writing memos was a time consuming task yet this was helpful in reporting the procedures of analysis where memos acted like funding the final writing of report (Glaser, 1978; Strauss and Corbin, 1990).

Through the three levels of analysis, different forms of memos were written for different purposes:

- Code note: to develop codes generated from open coding in terms of its properties and dimensions (Strauss and Corbin, 1990; Charmaz, 2006) (see information box 3 in open coding);
- Theoretical note: to extend the thinking about categories and their inter-relationships. Also to write about the descriptive story, the central phenomenon and the integration of the relationships between the core categories and the other categories (see information box 5, 6 in selective coding);
- Operational note: to reflect on the procedures approached in collecting data or the used methods, along with giving direction for sampling: where to seek information? Who to interview? To fill in caps that discovered during the analysis (Charmaz, 2006) or deal with difficulties faced in collecting data or analysis. The information box (7) reflects the content of memo about using e-mail interview, while information box (8) is about sampling directions.

Box 7

Memo on method: e-mail interviewing 13/06/2012

E-mail interview was helpful in doing several interviews at the same time, which help me saving time. It gave a very condense information and there were no much details that could help in identifying variations in the experiences of participants. I think participants edited their answers, which resulted in very brief information, or they may get bored with writing and lost their interest because people tend to speak more than writing, adding that social cues are absent in e-mail interview.

For these reasons, face-to-face interview is highly recommended to help in developing properties of categories and fill existing gaps.

Box 8

Memo: Sampling for creativity 01/02/2012

All the participants in the first round of interviews were PhD students and their views about creativity were not very clear, so next interviews would be conducted with Doctors and Profs because of their experiences in doing research. Especially that one of the interviewees suggested that questions about creativity should be asked to his supervisor:

"You would need to speak to one of my supervisors I think"

I am not assuming that their perspectives would be more matured than PhD students, but it is a direction that worth to go in and check out.

Memos helped in stimulating the thinking about data (Charmaz, 2006; Corbin and Strauss, 2008); similarly the use of diagrams, as a supportive tool to writing memos, in which they visualised and presented the relationships between categories.

Qualitative data analysis software (Nvivo)

During the 1990s, developments in computer software achieved a good progress in supporting the qualitative analysis; not yet in the way that a computer performs the analytical thinking or the understanding of data, rather in the way of managing qualitative data and making analysis easier and more reliable (Gibbs, 2002). Regardless of the limitations that software of qualitative data analysis could have such as; cost and lacking the direct contact, unlike data in paper form, between researcher and data (Fielding and Lee, 1998), it is effective when coming to the functions of managing qualitative data (Fielding and Lee, 1998; Lewins, 2001), especially coding, retrieving, searching and drawing conceptual maps (Seale, 2002).

NVivo software version 9 was chosen to assist the analysis of qualitative data. Functions of NVivo seemed to support analysis in grounded theory (Gibbs, 2002). It helped in data storing, searching and retrieving, creating codes, memos, and diagrams that visualise the relationships between categories.

Ethical Issues

Ethics is about the "morality of human conduct" (Edwards and Mauthner, 2002); it indicates the "standards of behaviour that guide the normal choices about our behaviour and relationships with others" (Cooper and Schindler, 2008: 34). Ethics concerns the rights of others (Bulmer, 2009). In conducting research, it was essential to understand and commit to ethics on behalf of societies, participants, and researchers such as respecting Intellectual property rights, and seeking permissions before contacting researcher in universities and institutions to ensure that no one is harmed.

Hammersley and Traianou (2012) identified five general ethical principles to be considered when conducting a research, which are: reducing harm, respecting independence of people, ensuring privacy, offering reciprocity and treating people fairly. In turn, Orb et al (2000) identified three ethical principles in qualitative research: *autonomy*, *beneficence* and *justice*.

Worthing of the project

Competence boundaries

Informed consent

Benefits, cost, and reciprocity

Harm and risk

Honesty and trust

Privacy, confidentiality, and anonymity

Intervention and advocacy

Research integrity and quality

Ownership of data and conclusions

Use and misuse of results

Figure 18: Ethical framework for conducting research (adopted from Miles and Huberman, 1994: 290-295)

Oliver (2003) and King and Horrocks (2010) insisted the moral justification of conducting a research and the way the research contributes to the world and society. Especially that ethics, research practice, and knowledge cannot be separated from each other (Doucet and Mauthner, 2002). Punch (2009) also concerned the issue of worthiness in doing research and summarised the ethical issues that occur during a research in five principles: "harm, consent, deception, privacy, and confidentiality" (Punch, 1994: 89). Seemingly, Miles and Huberman (1994) identified eleven ethical issues to be considered through the whole stages of doing research (figure 18).

Oliver (2003) classified the ethical issues as they occur in a research into three groups:

- Before carrying out a research: in which the concern is on identifying participant, introducing the research to participant, consent form and permissions.

- During the research: ethics concerns the issues of recording, participants' rights when collecting data (interviews or questionnaires).
- After collecting data: pertaining to the processes of storing, transcribing, using and reporting data accurately.

Ethics was considered throughout the different processes of research starting from research design, collecting data, analysis and reporting results as presented in table (9).

General Practice of ethical and professional issues	Questionnaire survey	Interviews
Respecting intellectual property rights. Providing the rational for research's procedures and approaches. Gaining prior permission from supervisor when meetings were recorded. Committing to the university ethical guideline.	Acquiring permissions from institutions and universities to distribute the questionnaire survey. Explain the research's purpose to participants. Ensuring participants' privacy, anonymity and confidentiality. Storing data securely. Reporting results accurately.	Explain the research's purpose to participant. Obtaining a prior written consent. Ensuring participants' privacy, anonymity and confidentiality. Gaining a prior permission before recording the interviews. Transcribing interviews records accurately. Storing interviews' records and transcripts securely. Reporting interviews data accurately.

Table 9: Ethical issues applied in the research

This research was conducted with a fully commitment to the ethical guideline of the University of Huddersfield (2011) for a good practice in teaching and research. Personal information of participants was processed with respect to the Data Protection Act 1988 of the

UK. More details are presented next in regard with the ethical issues that were considered in this research.

Information sheet

Olive (2003) and King and Horrocks (2010) stressed the issue of informing participant about the research before they accept taking part in it. Similarly, Gillham (2005) stated the importance of introducing the researcher him/herself by identifying name, address, institutional body, and title role, and informing participants about research topic, purpose, and consequences of participating in the research. However, one of the ethical concerns about informing participants is providing adequate and correct information (Alldred and Gillies, 2002) about the research purpose. Because "people react seriously to the thing that are done properly" (Gillham, 2005: 12) researcher is supposed to be practical and honest when conducting research, particularly when seeking people's participations.

This issue was fully adhered when questionnaire survey was distributed by providing an introduction about the research purpose along with contacts details of the researcher if further information was required by respondents. The same was done before carrying out interviews in which an information sheet was sent to participants along with consent form before accepting their contribution. The structure of information sheet (appendix 7) was adopted from the research ethics of Oxford Brookes University. This was approved by the supervisor because none of such forms was available in the practice of research ethics in the University of Huddersfield.

Informed consent

After introducing the research purpose to the participants and discussing any issues that concerns them, they became comfortable about making decision of taking part in the research or not. The information provided about research was clear and contained sufficient information to the extent that enabled participants to make their decision regarding the participation (Oliver, 2003). Informed consent indicates the participants' rights to know about

their participation, nature of research, and being able to withdraw at any time (Ryen, 2011, Bulmer, 2009). The principle of informed consent is "being open, truthful, and respectful of people's right to choose" (King and Horrocks, 2010: 113). The consent form (appendix 8) in this research was adopted from the research ethics of Oxford Brookes University and modified to fit the interview situation and method. This also was approved by the supervisor because none of such forms was available in the practice of research ethics in the University of Huddersfield.

Participants were required to sign the consent form acknowledging their volunteering participation in this research that they were informed about. They were also aware of the issues of recording interviews, storing and using interview's data securely and anonymously. The informed consent also indicated the participants' right to withdraw from the interview at any point and without providing any reason.

Obtaining permission from institutions can be included in this context of informed consent. It was essential to contact institutions and universities to gain their approval to distribute the questionnaire survey to their academic staff and historians. Similarly, when inviting postgraduate historians to interviewing, the invitation letter was sent to them via the head of the school, especially that their contact details were not on the university website.

Confidentiality and anonymity

Since the issue of protecting people involved in research is considered to be critical in the practice of research (Miller and Bell, 2002), researcher is required to pay attention to ensure confidentiality and anonymity of participants. In this regard, it is essential to mention the misunderstood of the meaning of confidentiality and anonymity in which they often considered to have the same meaning, while in fact they are different (King and Horrocks, 2010). Confidentiality is more equivalent to privacy (King and Horrocks, 2010; Oliver, 2003) where it indicates that personal information of participant is kept in privacy, while anonymity means that names of participants or identities are hidden or concealed when

reporting the results of the research (King and Horrocks, 2010; Oliver, 2003). Ensuring anonymity is of high importance when data pertain to a sensitive subject (Gillham, 2005).

Anonymity and confidentiality were highly ensured when conducting the questionnaire survey in which respondents were not required to provide any names, identities or private information, adding that data were securely stored in the database of the university. Regarding interviews, participants were promised and assured that the interview data would be stored securely in the university database, and used only for the purpose of the academic research. The actual names of participants and written consent forms were also stored securely and only the researcher had access to them. Both qualitative and quantitative data are not destroyed before the approval of the thesis. Participants' real names were meant to be hidden from the final report of the thesis when quotes were provided. However, fake names and some key information such as a participant gender, title role and area of interest were provided for each quote to give the incident some sense of reality.

Summary

Research design and methodology have been discussed in this chapter. Pragmatism was adopted as a research paradigm because it permits the integration between quantitative and qualitative approaches to answer different types of questions. Accordingly, both approaches were applied sequentially in which a survey research was firstly carried out using online questionnaire to assess the information needs of historians working with digitised sources in the UK. Results of questionnaire helped defining the research problem and sampling for qualitative research approaching a grounded theory method using semi-structured interview. Procedures of designing and carrying out data collected techniques were presented in details as well as the analysis process. Ethical issues were fully considered and applied when conducting this study regarding the University code of practice, informing participants about the research, obtaining informed consent, and ensuring confidentiality and anonymity of participants.

Chapter 3: Questionnaire Results and Discussion

Introduction:

This chapter is devoted to present and discuss the results of the questionnaire that was conducted in the first quantitative phase of this research. The primary goal of this questionnaire was exploring the attitudes of historians towards digitised primary sources in terms of usage, preference and usefulness.

Since the literature is not rich in the studies that interested in digitised primary sources, these results are mainly compared with the Canadian study conducted by Duff et al (2004 a, b) to assess the usage of archival materials. It was not possible for the current study to be structured on the result of Canadian study that had been done in 2004, especially after thinking about the developments that could be achieved in a period of 6 years in the area of IT and digitisation. This questionnaire reflected many aspects from the Canadian study in an attempt to be consistent with the literature and to establish a robust ground for further investigation in the next qualitative phase.

258 historians from around the UK responded to this questionnaire. Profile of respondents is presented first to view their different attributes. The results are demonstrated in sections where they fellow the design of the questionnaire to end up with concluded comments.

Respondents

Respondents to this survey meant to be historians who worked/are working with digitised and/or original primary sources from different disciplines, institutions, and universities in the UK. Respondents' gender and mode of study or work (full/part time) were not of a concern in this context; rather questionnaire asked about their length of experience, profession status, and age. Profile of respondents is illustrated in table (10).

Questions about time periods of research's interest as well as the one that asked about length of experience were located in the beginning of the questionnaire, while questions about age and profession status were located at the end. The reasons beyond this is that the first two questions introduce respondents to the next set of questions, meanwhile the other questions pertain to demographic information than the subject of the questionnaire.

Attribute	Category	Proportion
Age (N=258)	Under 25	7.8%
	25-35	27.1%
	36-45	21.7%
	46-55	22.9%
	Over 56	20.5%
Research interest (n=257)	Medieval	18.6%
	Early modern	25.2%
	Modern	55.6%
Experience length (n=258)	Less than 1 year	4.7%
	1-5 years	26.7%
	6-10 years	22.9%
	More than 10 years	45.7%
Profession status (n=255)	Pre-doctoral student	5.8%
	Doctoral student	30.6%
	Post-doctoral student	5%
	Academics	46.9%
	Senior academics	10.5%

Table 10: Respondents' profile

Table suggests that historians aged between 25-35 forms the largest group of respondents with a figure of 27% in which 32 of them were doing their doctoral study and another 29

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were teaching or doing academic research. The smallest group was historians aged under 25, while the rest of age categories fluctuated around 21% with an approximate difference of 1% less or more.

Historians' interest was allocated in three main historical periods:

- Medieval: covers the period from 500-1499;
- Early modern: covers the period from nearly 1500-1799; and
- Modern: covers the period since 1800.

The majority of respondents expressed their interest in early modern and modern periods of history; comparing to only 18% who located their interest in the era of middle history. Interestingly, historians who spent more than 10 years in doing research and teaching at university were the largest group participating in this research. Historians who had an experience of 1-5 years came second with a rate of 26.7%, while 22.9% of them had an experience varied between 6 and 10 years.

Only 12 respondents had just started their research. Having more than 65% of respondents with an experience of 5 years and above; considerably enriched the questionnaire outcome. Among the respondents there were 15 historians doing master degree or had just finished their BA. Historians who were preparing PhD, teaching or involving in academic research consisted the high percentages of 30.6% and 46.9% respectively. Post-doctoral students participated in a figure of 5% to be doubled for senior academics entitled as professor and professor emeritus.

Doctoral students and academics were the most frequent groups of historians (77.5%). The importance of these two groups comes from the diversity of their age groups and length of experience, especially to know the influence of age and level of experience on the historians' preference and attitude towards searching and using digitised primary sources. For example, academic historians are aged between 25 and over 56, and their experiences as well vary

between 1 year and over 10 year. Remarkably, 84 out of 121 academic have an experience of 10 years and over; similarly as all of senior academics have.

Findings and discussion

Findings from the questionnaire highlighted several issues that are categorised into:

- Sources that historians used in their research and how they located these sources;
- Historians' preference between using original and digitised primary sources;
- Problems faced when searching and using primary sources; and last
- Historians' concern of authenticity and physical features.

Research sources:

Historians use original primary sources most in their research; however, the usage of digitised sources is seen to be promising. The high usage of original sources is reasoned by their availability as shown in progress. Q3 asked historians to identify the format of primary sources they use most in their research. Original and digitised primary sources were the options that they advised to select from, along with having an option for other sources if there were any. According to the frequency of using historical sources (figure 19), historians can be categorised into four clear groups:

- Historians who use original most;
- Historians who use digitised most;
- Historians who use both digitised and original; and
- Historians who use other type or sources.

The highest figure was located for the usage of original primary sources. Regardless of the fact that only 26.75% of respondents selected the digitised primary sources to be the most used, it is still encouraging, and denoting the influence of the digital environment on historians. 20.9% of respondents used both original and digitised sources, whereas only 9 respondents were using another type of sources such as secondary sources, oral history, microfilm and microfiche.
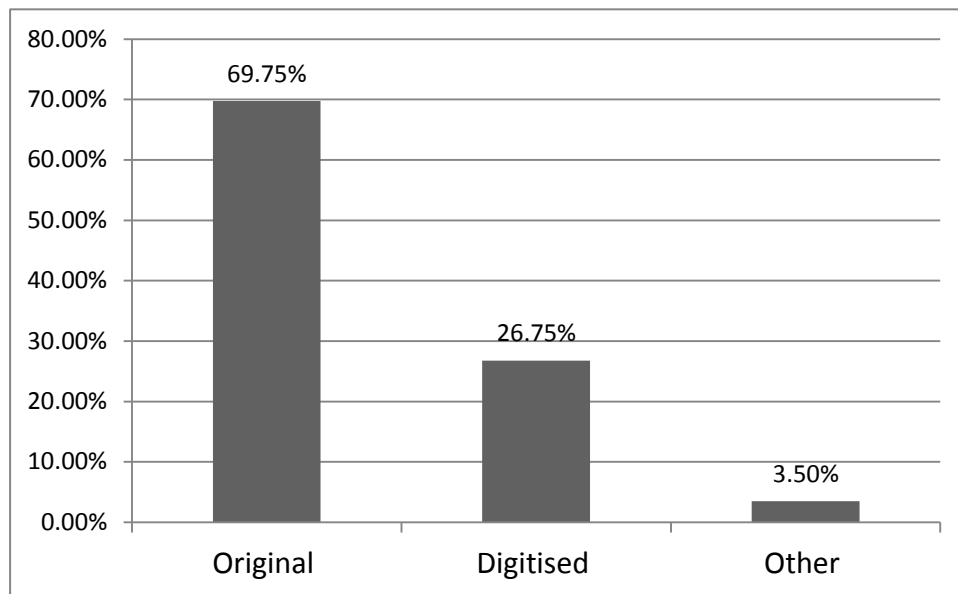
Figure 19: Formats of sources used in historians' research.

In contrast with the literature, it was not surprising to find that originals are still the dominate source for historians. 90% of Respondents in the study of Duff et al (2004 a, b) stated that they used original source, while only 25% of them used digitised sources. Also, Duff reported usage figures of 50% and 76% for microfiche and microfilm respectively, while the current study reported a sharp decrease in their usage. However, the interesting point is the positive attitudes of historians towards digitised sources, and the gradual raise in using digitised sources.

Then respondents were asked again according to their selection to identify the most used type of original or digitised primary sources. They had been given seven options (letters, manuscripts, diaries, maps, photos, paintings, and other). Moreover, a why question was required for respondents to justify their selections.
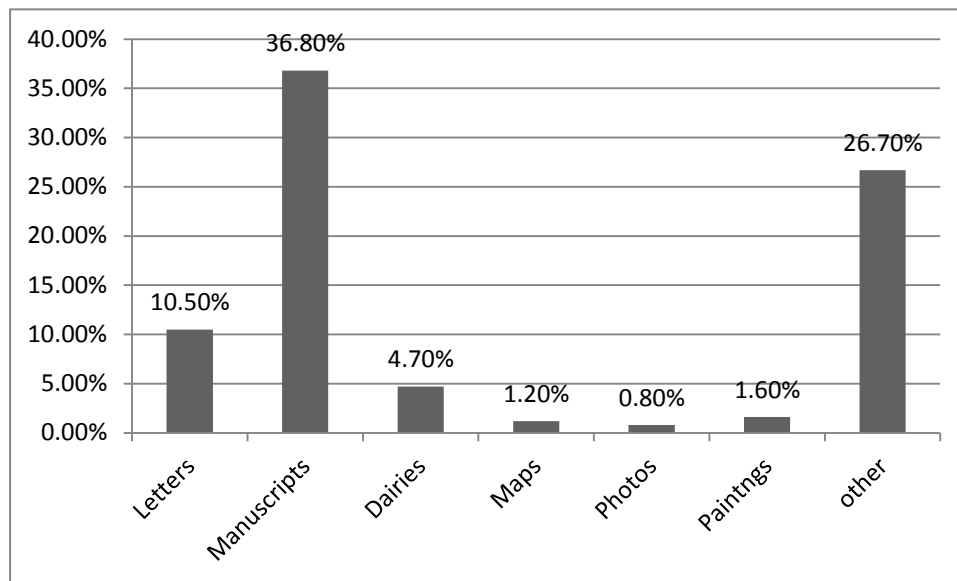
Figure 20: Types of original sources used by historians

Regarding the types of original sources that historians used (figure 20), respondents used manuscripts, letters and diaries most. While 4 respondents selected paintings, another 3 selected maps, and only 2 respondents selected photos. 26.7% of respondents used other types of original primary sources like newspapers and journals, magazines, governments' records, posters, research notes, and coins. Having a high figure for other sources was caused by not identifying enough types of original primary sources; however, this in turn reveals the wide variety of primary sources that historians use, especially when it comes to government records.

In the same way, manuscripts were the most used digitised format with 13.6% of respondents, 1.90% used letters, 1.20% used diaries (figure 21). Just 2 respondents used photos most, and equally 1 respondent for each of maps and paintings. 20.5% of respondents used other types of digitised primary sources with 45 respondents mentioned using digitised newspapers.
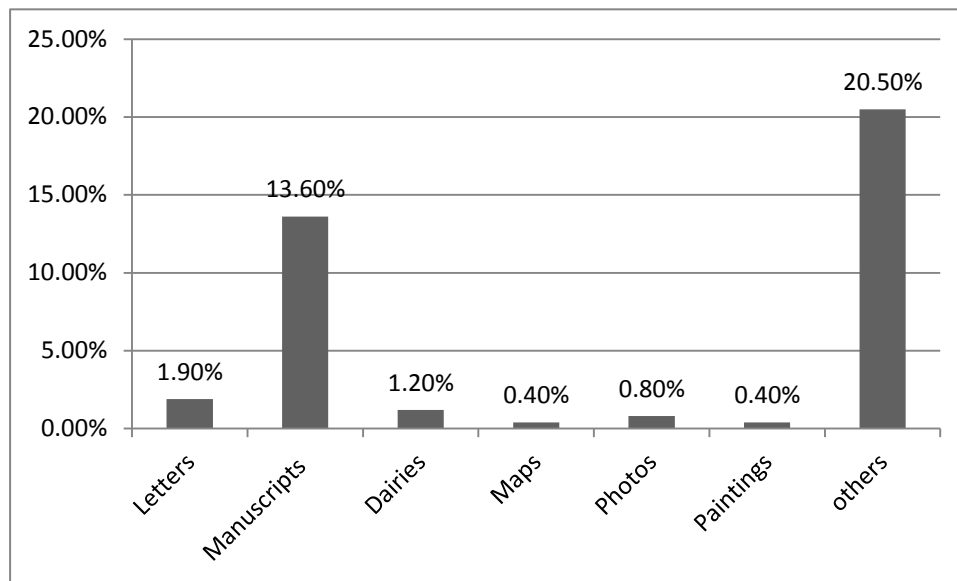
Figure 21: Types of digitised sources used by historians

Duff et al (2004b) did not ask historians about the types of original sources they use most, yet they concerned historians' perspectives about the importance of these types. Manuscripts were the most important sources in historical research followed by printed records. Photographs came fourth in importance, while maps came fifth. Historians in the study of Stieg (1981) rated manuscripts as the thirdly used after periodicals and books, yet the second inconvenient source after microcopies. Dalton and Charnigo (2004) obtained identical results regarding the three first rating materials when they revisited Stieg's study. This inconvenience in dealing with manuscripts was derived from geographical difficulty that can be exaggerated when lacking money and time, adding the difficulty of locating and reading manuscripts, and sometimes because manuscripts were improperly serviced (Stieg, 1981). Considering manuscripts as fairly the most used but inconvenient introduces digitisation as a very effective way of overcoming these barriers.

Justifications for using different types of originals sources was completely surprising to find that 107 respondents, half of respondents, used original sources because they are the only available format and not digitised yet, while 23 respondents revealed their needs to see the originals because they are more informative, authentic and reliable. If this can indicate anything it would be the historians' wish of getting more digitised sources in order to benefit

from the online access as claimed by respondents who used digitised primary sources, especially that digitised sources were said to be more convenient, easy to search and use; as well as their role in saving historians' time, efforts and money.

Finding tools

Historians locate and find their sources using both formal and informal tools such as online/traditional catalogues, bibliographies, indices, footnotes and archivists. Unlike previous studies that revealed the frequent use of traditional finding tools (Stieg, 1981; Duff et al, 2004b; Tibbo 2002, 2003); currently historians used online researching tools most, which can be explained by the advance of online searching facilities; beside the historians' desire to adopt and benefit from new technologies.

Q6 asked respondents to rate the tools that they normally use to locate their sources. Six types of finding tools were given to rate in terms of the most used, often used, and infrequently used as illustrated in table (11):

- Traditional tools: involve printed catalogues, bibliographies and indices that require going to archives to access these kind of tools;
- Footnotes and references in secondary sources;
- Informal ways: involve talking with colleagues, and contacting archivists or librarians;
- Visiting archives, libraries, museums and intellectual institutes to discover their contents;
- Online finding tools involve search engines, online catalogues and bibliographies; and
- Serendipitously that refers the discovery of relevant sources by chance when browsing archives shelves or online search.

Remarkably, online finding tools were rated first as the most used tool by respondents when searching for their primary sources. This again reveals the impact of technology on historians, especially when noticing the deterioration in using traditional finding tools with a difference of 37.60%.

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Finding tool	Most used	Often used	Infrequently used
Printed catalogues & bibliographies	20.50%	48.80%	30.60%
Footnotes	24.40%	62.80%	30.60%
Informal way	6.20%	49.40%	13.20%
Visiting archives	51.90%	36.40%	11.60%
Online finding tool	58.10%	32.20%	9.70%
Serendipitously	4.30%	41.90%	53.90%

Table 11: Finding tools that historians use

Visiting archives and libraries was the second high rate because being there is the best way to discover about sources and getting help from archivists who know about sources like no one else does. Historians in the study of Dalton and Charnigo (2004) rated visiting archives fourth. Interestingly, Duff and Johnson (2002) reported in a qualitative research the importance of archivists in making historians familiar with archives, especially that not all sources are recorded in catalogues. Adding that talking to archivists is a very easy method of locating sources comparing to paper catalogues.

Respondents used footnotes in secondary sources most by a figure of 24.40%, to record the highest figure in terms of often usage by 62.40% of respondents. Similarly, Dalton and Charnigo (2004) reported footnotes as the second used tool after finding aids. Using secondary sources to familiarise themselves with research topic may lead historians to discover important primary sources.

It is stimulating to find that 6.20% and 4.30% of respondents depended mostly on informal ways, and serendipity in finding their sources. Alternatively, these figures considerably increased in terms of "often usage" to become 49.60% for informal ways and 41.90% for serendipitously. Dalton and Charnigo (2004) emphasised the role of serendipity more in finding secondary information when browsing in archives and libraries, While Duff and Johnson (2002) mentioned the role of exploring the context of primary sources in finding useful information.

Unlike the current questionnaire, Duff et al (2004b) concerned finding tools in terms of importance to historians not in term of usage. They found traditional finding aids of archives very important followed by archivist, footnotes and colleagues, while online search came seven in importance. In the literature, traditional finding aids were most used by historians (Tibbo 2002, 2003; Anderson, 2004); in turn they expressed a desire to use detailed online finding aids (Anderson, 2004). Tibbo (2003) and Anderson (2004) conducted the same study in different countries (USA and UK) about how historians locate their sources, and the interesting point was that historians in the UK did use online and informal finding aids beside the traditional ones more than those in the USA.

Historians' preference: original vs. digitised

Historians prefer using original primary sources; in turn they find digitised primary sources most useful. Knowing the source's format that historians prefer along with the reasons beyond this; was the primary concern of this study to highlight any changes occurred to their attitudes towards digitised sources.

Firstly, respondents were asked to choose the preferred format (Q7), and then to provide a reason for their choice. It is apparent, as illustrated in figure (22), that historians still prefer original sources with a figure of 70.50%, comparing to 29.50% who preferred digitised sources. These results come in consistency with the ones of Duff et al (2004 a, b), but with a slight decline regarding originals, and a considerable increase regarding digitised sources.

They reported that 92% of historians liked original sources most and only 2% liked digitised sources most; likewise many studies that supported the dominant role of original sources (Graham, 2002; Dalton and Charnigo, 2004) with positive attitudes towards IT.
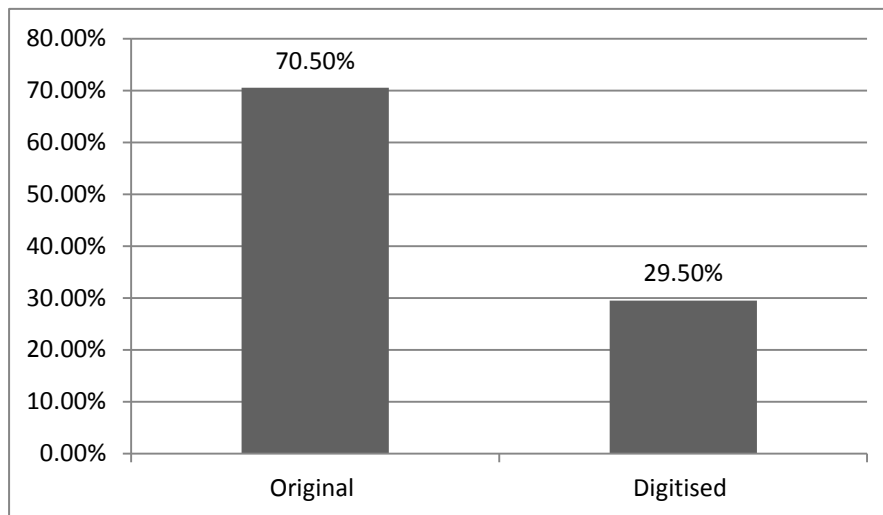
Figure 22: Historians' preferred format

Then historians were asked to choose the most useful format (Q8) along with providing a reason for their choice. The term *usefulness* was left for respondents to define according to their experiences that revealed the term to mean using/accessing online sources easily.

It was satisfying that 54.50% of respondents found digitised sources more useful; comparing to 45.350% who found originals most useful (figure 23). These results support an early study of Duff and Cherry (2002); where they compared the use of Early Canadian Online collection that was available in three formats (paper, digital, microfiche) where users found digitised format most useful. Unlike the study of Duff et al (2004b) that reported originals as the most useful format with a figure of 68%, while only 7% found digitised to be the most useful. This contrast in both studies of Duff may due to the sample of participants, where in the study of Duff and Cherry (2000) most of respondents were students and internet users, while in the one of Duff et al (2004b) they were academics.
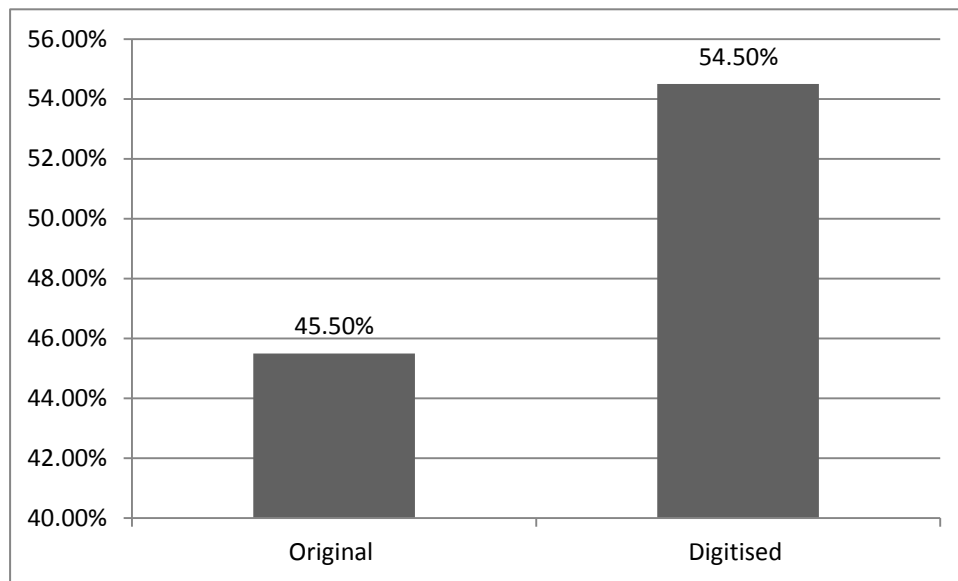
Figure 23: Historians' most useful format

For historians original sources mean a direct link with history and enable them to feel the sense of the past, which extremely give them the excitement of discovery:

> "I want as few people as possible coming between me and the person who created the source I am studying"

It is the enjoyment of dealing with the real source that had been created thousand years ago. Apart from this, there were many other reasons, presented in priority, stood beyond historians' attitudes of preferring originals and considering them as the most useful:

- Legibility: original sources are easier to read and comfort for the eyes, especially that some respondents do not like reading on screen;
- Complete information: historians like to touch, feel, smell, and leaf the source. They are interested in the physical features (size, ink, colour, hand writing, faint, or marks), annotations, notes on back, and marginalia;
- Context: searching and using original sources would allow historians to see the pamphlets or manuscripts as a whole source unlike digitised sources which are usually

selected and categorised separately. Adding that browsing in archives allows the serendipity of discovering related materials;

- Authenticity and reliability: original sources are always accurate and trustful.
- Availability: some respondents revealed that they have to use original source because it is the only available format, and their research sources are not yet digitised;
- Habit: few respondents mentioned that they only used to look at original sources;
- Computer literacy: two respondents revealed their faith to the traditional sources against the IT.

In contrast, online access and convenience were the key reasons that drove historians to prefer using digitised sources, and considering them the most useful. One of the respondents expressed the joy of using digital sources:

> "I can access sources at home, read Tudor handwriting slowly, [and] enlarge difficult words"

The term *access* refers the online retrieve and use of digitised sources, and *convenience* meets the suitability of historians' situations. Actually, access and convenience are two sides of one coin and both terms are closely related to IRS of digitised sources.

Indeed, by using digitised sources historians do not need to travel to remote archives spending their time and money, especially for students who have restricted time. Adding that, digitised sources are more helpful for teaching and presenting purposes in order to share them with students. Searching the text itself, enlarging text, saving a copy to revisit later, and the ease of using and reading digital sources were stated also by respondents to justify their attitudes of using digitised sources. Four respondents highlighted the role of digitisation in saving the original sources from overuse. In turn, a few respondents were unable to state a preference for one format, and they acknowledged the advantages of both formats.

One of the interesting points in this context exists in the historians' attitudes and tendency towards using digitised sources; unlike the majority in Duff's study who did like originals most; and the digitised least. However, this positive attitude of historians towards digitised sources was not very clear until recently. This point was supported by the results of a theoretical analysis study done by Anderson (2009) that concluded a kind of resistance to digital technology by historians.

This decrease in preferring original sources for the merit of digitised ones; reveals considerable changes in historians' attitudes towards IT in general and digitised sources in particular. Admitting digitised sources as the most useful is an occasion for appreciating digitisation technology by historians, and alerting the importance of understanding their needs in order to be further satisfied.

Difficulties faced by historians

The most problematic issue that faces historians when seeking original sources is geographical location of archives; followed by difficulty in locating or finding primary sources. It was of importance to know the type of difficulties that historians faced when searching and using original sources in order to identify the areas where digitisation could be helpful. In Q9 respondents were asked to rate the problems that encountered them when searching for original primary sources. They were given five types of difficulties:

- Geographical location: where sources are located in remote archives;
- Source condition: especially when sources are fragile or not in a good physical statues, which may cause them to be out of use;
- Difficulty in locating original sources;
- Legislation for security that archives have regarding some special or secret collections;
- Permission that historians may need to be able to access certain archives or sources.

Respondents were required to rate these problems as most problematic, problematic, and least problematic. Table (12) presents geographic location as the most problematic situation

faced by historians in their research with a percent of 56.6% and problematic for 38% of respondents.

Difficulty	Most problematic	Problematic	Least problematic
Geographical location	56.60%	38%	5.40%
Source condition	11.20%	42.20%	46.5%
Locating original sources	15.10%	38%	46.90%
Legislation	11.20%	24.40%	64.30%
Permission	4.70%	20.20%	75.20%

Table 12: Difficulties faced by historians in searching original sources

Finding and locating primary sources was rated as the second most problematic issue. Source condition and legislation were equally rated third, while acquiring permission to access sources was considered as the least problematic issue. Fragile source could not be accessed physically, which may affect historians' progress especially that 42.2% respondent rated source condition as problematic.

These results come in line with Duff's findings (2004b) that highlighted thirteen problems faced by historians in accessing sources. Correspondingly, remote locations, being unable to place sources and source condition were the most encountered problems by historians. Sharing the agreement with Duff (2004b), digitisation technology is seen as the right

application that helps in in overcoming some of these problems, and brings sources to historians' desktop especially that historians started to rely on digital sources.

Authenticity and physical features

Historians trust digitised primary sources and often they do not question their authenticity, especially if they are affiliated with formal institutions. Since historians showed a good usage of IT and digital sources, it was interesting to know whether historians trust digitised sources or not, especially that many may claim that digital sources are more applicable to amendments than originals. Q10 asked respondents whether they had ever questioned the authenticity of digitised primary sources (authenticity of a record refers being original and not changed science it was first created), and if yes, which situation caused them to do so.

Questioning authenticity and reliability of archival sources seems to be one of the general characters of historians. Duff et al (2004b) asked the same question, but for original sources in general avoiding the concern to a particular format. Their study reported that 18% of respondents always or often question the authenticity of archival sources, especially when encountering reproduction errors, incomplete provenance, or being manipulated. Meanwhile, only 13.60% of respondents stated that they question the authenticity of digitised sources (figure 24).
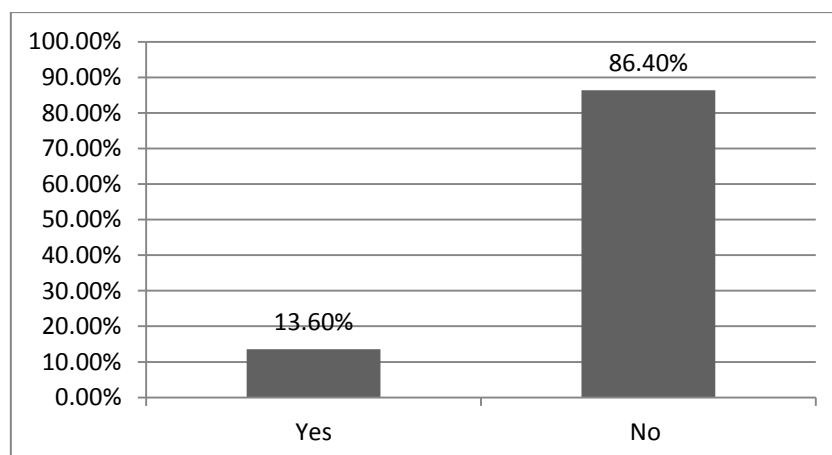
Figure 24: Questioning the authenticity of digitised sources.

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Regarding the situations where historians suspected digitised sources, in the current study respondents mentioned incidents like; finding wrong information, incomplete copy or information, typos, errors, and poor quality image. Full provenance is required and digitised sources should be hosted by affiliate sites in order to be trustworthy, especially that one respondent mentioned that digital materials can be easily edited by Photoshop. Another respondent stated that suspicion occurred when finding through sites more and other than can be located in libraries, archives or even trusted websites.

However, what makes original sources preferred is being tangible. Some types of historical researches require physical access to original sources. Physical characters of original sources add value to research and enable historians to feel like touching the real source with the real type of paper and ink used by its author. The study of Duff et al (2004b) neglected this issue because their intention was not to compare between original and digitised sources, as in the current one. In Q11, respondents were asked whether they do concern the physical features of original primary sources or not, and in which situation they did.
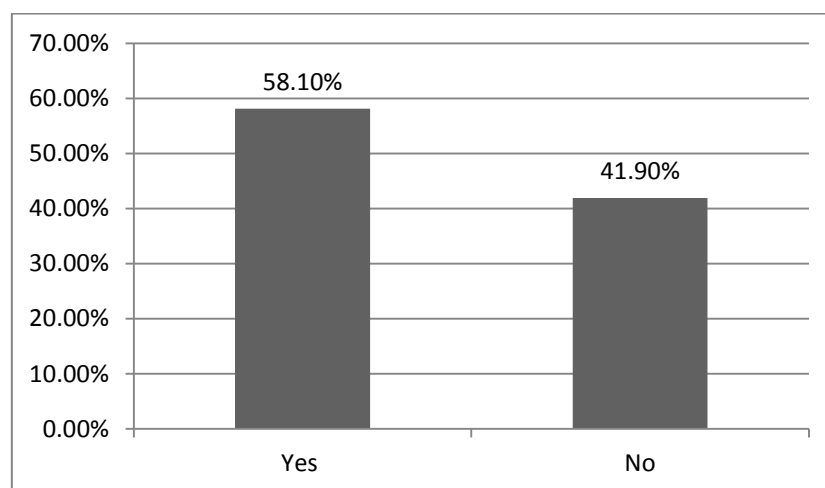
Figure 25: Concerning the physical features of original sources.

More than half of respondents (58.10%) expressed their interest in the physical features of original sources (figure 25), especially in the situations where researcher works with drawing, painting, coins, seals, posters, cuneiform tables, comments and notes in margin,

handwriting and erased annotation. In addition, checking authenticity and determining provenance are subject to the physical features of sources.

Accessing original sources in their physical state is not just helpful for descriptive purposes, but also in evaluating and analysing the source, which help in interpreting the complete story that historians want to tell. For example, type of paper, ink and colour are very important aspects in determining the source's purpose, audience, and period:

> "...this can provide valuable clues as to who a source was produced for. If the paper is poor quality then it suggests that the tract was produced for a wider audience, whereas if the paper quality is fine then it suggests a more exclusive market"

Emphasising the issue that understanding the physical background of originals is so important for many historians and stimulate their creativity, there should be a way of satisfying these needs virtually. One way of doing so is by including a full descriptive of sources edited by professional historians who can understand what is interested and useful for them.

Concluding comments:

For historians, the need to access original sources is logically derived from their subject nature of dealing with past events and concerning the physical features of sources. This need is ultimately acknowledged, nonetheless thinking about the future of original sources along with developments in IT; directs the interest to digitisation as alternative, especially for fragile sources. Appreciating digitised sources by historians as a very useful format in terms of access and convenience; articulates considerable changes in the ISB of historians, as well as introduces for a new era of digital archives. Especially when considering the difficulties faced by historians when searching for and/or using original sources, in which remote archives and conditions of sources were the most encountered difficulties.

These problems could influence the productivity of historians, especially if the original is the only available format and no alternative (digitised, microfilm or microfiche) exists, and placed in remote archives or libraries. This problem might be greater if this original source is not physically accessed due to its fragility, which may lead historians to change the context of their research to avoid such difficulties.

Regarding the variety of participants, it is noticeable to conclude that historians prefer using original primary sources and none of their attributes such as age groups, professional rank, subject interest, and experience length did affect this preference. Meanwhile, these attributes affected their preference when using digitised sources as explained next.

Results demonstrated the effect of age on historians who considered digitised sources as the most useful. For example; the highest percentage of historians who found digitised sources most useful was located for those aged 25-35 year to be deteriorated with older age groups (figure 26).
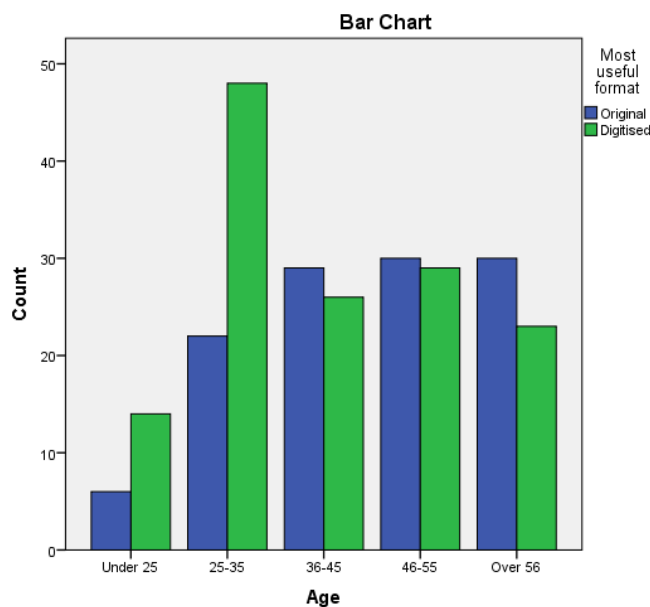
Figure 26: Most useful format vs. age groups

The same phenomenon has been also noticed when using online search to locate sources. Despite the fact that all respondents used online finding tools, the highest rate was recorded for historians aged 25 to 53 year. In terms of professional rank, all categories articulated the usefulness of digitised sources except the senior academics group who were also the older and had the longest experience (Figure 27).
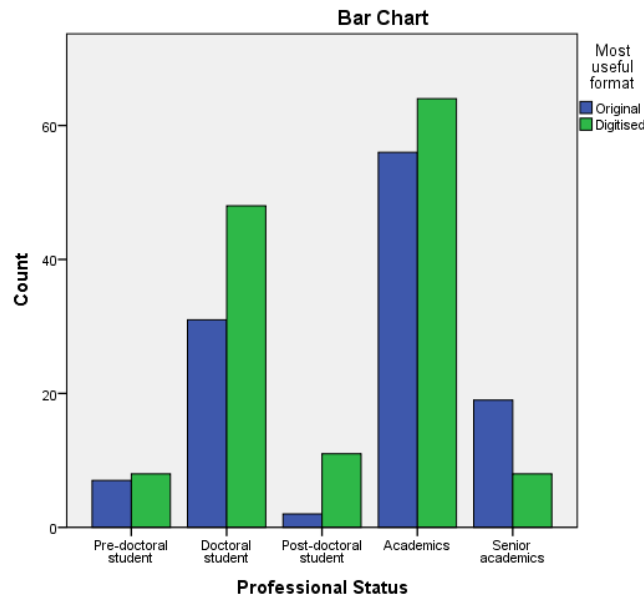
Figure 27: Most useful format vs. professional statues.

Historians who have an experience varied between 1 -10 years found digitised sources most useful (figure 28). Originals were considered as the most useful format by those whom their experience exceeded the 10 years, in turn there was a considerable number of them who thought digitised are the most useful.
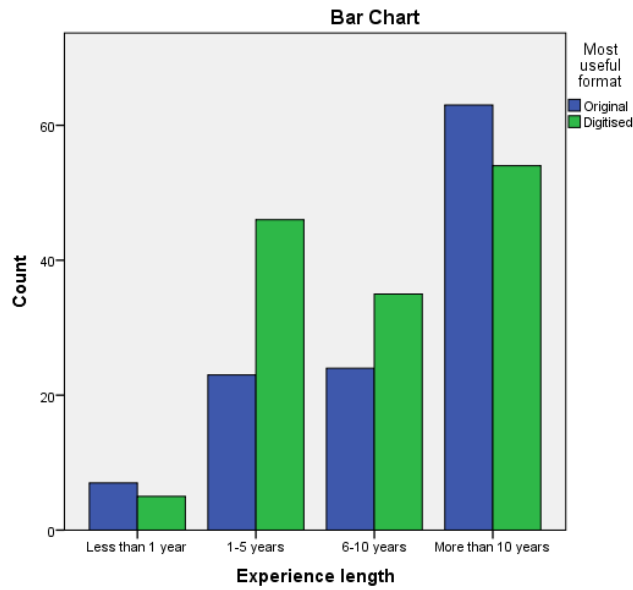
Figure 28: Most useful format vs. experience length.

Regarding the historical periods that historians interested in, respondents of different interests believed that digitised sources are most useful (figure 29). Though the majority of historians considered digitised sources to be the most useful format, there are several elements, apart from attributes of historians, which affected historians' preference and encouraged them to use digitised sources. For instance; having difficulties in physical access and locating sources in remote archives contributed in encouraging historians to use digitised sources.
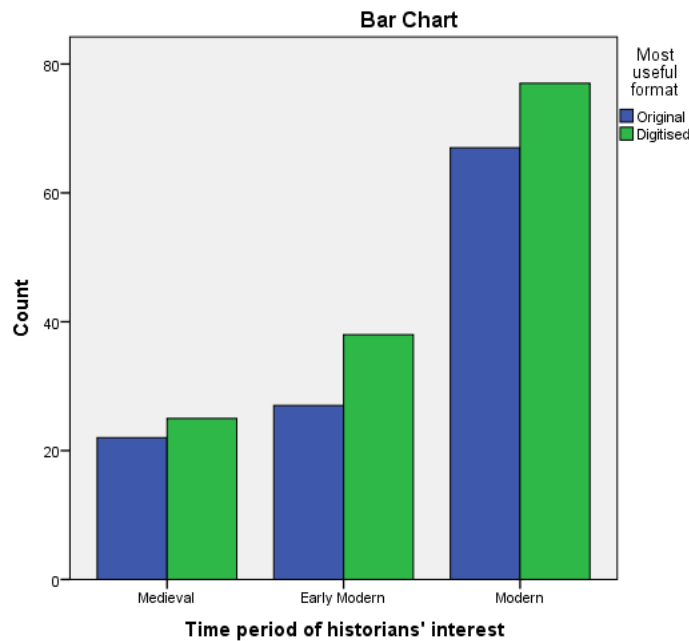
Analysing the age group (25-35) of historians who found digitised sources as the most useful format brought some issues to the light, which can help in justifying historians' attitudes and behaviour towards digitised sources:

- Exploring the difficulties related to geographical locations in terms of historians' age denotes that this age group (23-35) was encountering the difficulty of remote archives most. This difficulty caused historians to change their behaviour and look for convenient and easy access of sources;

- Historians in this age group are either PhD students or academics. PhD student usually have limitations on time and financial resources. Chasing original sources in remote archives is not helpful for PhD students where time is a very critical element. In the same way, academics are involved in teaching tasks and administrating students' works and this task is also a time consuming. Adding the difficulties of using original sources for teaching purposes comparing to digitised sources that can be very easily shared with students or included in teaching materials;

- Historians ages 25-35 or around this age can be described as the generation of internet. They were raised up, educated and learnt to do research in the environment

where internet is highly available. This convenient life style may influence their behaviour to some extent.

Experiencing the benefits of digital technology, especially in overcoming difficulties encountered when seeking original sources, contributes in making the attitudes of historians about digitised sources more robust. Adding that, digitised sources are increasingly acquiring historians' trust, especially if affiliate with formal intellectual institutions. This supports the clam that digitisation can be introduced as a very useful application in archives to serve both preservation and access purposes, particularly for fragile sources. Archival materials are very unique and precious, and this value would be greater if they were widely accessed by historians to promote their productivity and creativity in interpreting historical events.

Now the situation can be articulated as; historians prefer using original sources, yet they find digitised sources most useful to them. However, questioning the situation in another way raises the argument that can be delivered as; since digitised sources are most useful, why historians still prefer using original sources? Or what is missing in the IRS of digitised sources that makes historian still prefer using originals? One way of answering this question is by understanding the ISB of historians and exploring their experiences with digitised sources. In the view of this, the investigation is carried further in a qualitative phase using semi-structured interviews starting with an initial sample of young historians because they are the biggest category who considered digitised sources most useful as suggested above. Results of qualitative interviews are presented in next chapter.

Summary

In this chapter, results of online questionnaire have been presented and discussed in the light of previous studies. Profile of respondents was presented regarding their attributes of age, period of interest, length of experience, and professional status. Results were statistically illustrated regarding the historians' use of sources, finding tools, format preference, difficulties, their concern about authenticity and physical features. Similar evidences were

found to support the leading role of original sources in historical research (Delgadillo and Lynch, 1999; Dalton and Charnigo, 2004; Smith, 2004; Duff et al, 2004 a, b; Anderson, 2009), yet with a promising usage of digitised sources along with a very positive attitude when considering them the most useful.

Chapter 4: Interviews Results

Introduction

As previous chapter presented and discussed the results of online questionnaire, this chapter is dedicated to demonstrate the results of interviews that were carried out to collect qualitative data in a grounded theory approach. Situation was defined in previous chapter indicating some limitations in IRS of digitised primary sources. Therefore further investigation was required to know more about the experiences of historians working with digitised sources. This was achieved by investigating the ISB of historians that helped identifying some problematic issues when seeking original sources, particularly the digitised ones. In the context of ISB of scholar historians, creativity was essential required where the investigation was driven to explore the ways that historians approached to be creative when doing research. Using the method of wishful thinking, historians were stimulated to identify the ideal components of IRS of digitised sources. Merging between limitations of IRS, useful functions that historians wished for, and strategies of stimulating creativity proposed a set of enhancements to IRS of digitised primary sources. This chapter presents findings of interviews in three parts:

- ISB of historians where five stages are identified when historians seek primary sources. In this part, differences between seeking behaviour of original and digitised primary sources are clearly demonstrated;
- Creativity of historians: where different strategies that historians approach to stimulate their creativity are illustrated;
- Enhancing IRS of digitised sources: where several enhancements are proposed to different areas of IRS of digitised sources in the ways that stimulate the creativity of historians.

Results of interviews are accompanied with excerpts from the interviews to support and validate this demonstration.

Part 1: Information-Seeking Behaviour of historians

ISB refers the processes or activities that individuals' go through to fulfil certain needs. ISB was one of the main issues that were investigated by interviewing scholar historians using grounded theory approach in which they revealed five main stages:

- **Identifying needs**: is the initial stage where historians try to identify their needs;
- **Following information**: in this stage historians perform a search to locate the identified sources;
- **Access**: refers the stage where historians access the required sources;
- **Judging relevance**: and deciding which sources are relevant or not;
- **Absorbing or using information**: the final stage in which historians intensively read the relevant materials and use the abstracted information in their research.

Each of these stages is explained in details; however, initially, it is crucial to illustrate the ways that ISB may vary in:

- Types between browsing, where need is not defined, and directed search where need is defined;
- Methods that follow whether it is physical (in archives), online (digitised system) or involves both online and physical search;
- Intensity and degree of focused can vary between low and high;
- Duration in which seeking behaviour may take short or long time;
- Target and needs whether they are known and defined already or not.

Generally, when the information needs are already defined, seeking behaviour would be approached through a focused and direct search to satisfy the defined needs, while if needs are not defined seeking behaviour would start with unfocused browsing. However, approaching a physical seeking behaviour takes longer time than the online one; because going to archives is time and effort consuming. These statements may seem like general hypothesises, on another hand defining all properties and variation that an ISB has in general

contributes to the understanding of the whole context along with the potential issues that may occur.

Before proceeding to first stage of ISB, a brief demonstration of what motivated historians to carry out their research is provided. The first thing that triggered historians to do research was their interest in history. Actually, it is not just a normal interest; some stated that they were passionate about history:

> "I just became engrossed in every aspect of historical studies so medieval, early modern, Indian, everything, the whole, anything to do with history and politics I just became absorbed with that" Edward, male PhD student and lecturer, modern history.

> "I am doing the research because it is something I am very passionate about, and I think if you [are] going to take a PhD you really need to be passionate about it because you obviously have to eat, drink and sleep it for at least 3 years, and at least if you [are] passionate about it, then you are not going mad" Dave, male PhD student, early modern history.

Indeed, being highly interested in the research area is an important element to sustain the research progress, especially if research takes long time such as a PhD study as Dave mentioned. Edward was very interested in everything about history regardless of his failure in history when he was in college. He stated that in college they were teaching history poorly and usually if one did not like a subject in school, his interest could be negatively impacted. However, the case for Edward was completely different.

The second type of motivation was lacking knowledge about a subject. When the state of knowledge about subject is low, a need emerges to do research to fill in the knowledge gap:

> "What drive me is just recognising some gaps in the knowledge that information has not been collected before just is not there, so the starting point is there" Anabella, female PhD student; early twentieth century.

The third type of needs was career motivation. Doing research can help career promotion in two different ways: one way is acquiring new knowledge and developing skills related to career:

> "One of the things that I am very capable in is actually writing about history" Edward, male PhD student and lecturer, modern history.

 Another way is by acquiring new qualifications:

> "It is better than working on a building site, which is what I was doing previously" Dave, male PhD student, early modern history.

Interest, gap in knowledge, and career promotion are general motivations to do historical research. However, when it comes to ISB there are more specific tasks or needs to satisfy such as; finding information or sources that pertain to research topic as will be seen next when explaining the different stages in ISB of historians.

Identifying needs

Activities in this stage usually, involve the initial search about research topic or certain issue in historians' field or area of interest. The concern of historians is located around the issue of where to start, or which sources to look for. Historians usually do this using variety of sources such as reading secondary sources, searching catalogues or visiting archives:

> "At the early stage I tried to visit both archives and local history libraries in those locations, usually about three times because I think with the archives particularly, takes about three visits, even with the online catalogue, it can take about three visits to actually get to the nub of what is you are looking for" Anabella, female PhD student; early twentieth century.

The first thing that Anabella did was visiting archives, and as she was interested in women who elected to local councils throughout London and Wales, she tried to identify some names to search for or geographical places to investigate in. Reviewing literature or reading secondary sources is another way of being familiar with research topic, and identifying where

to look next. Footnotes and citations in secondary sources are essential method of discovering primary sources:

> "Obviously the first stage in any of these projects would be some kind of literature search, which allowed you to understand where the historic roughly stood" Chris, male Prof, late mediaeval and early modern history.

> "How I came to this (in retrospect, self-evident) point was through reading more widely in secondary works" Calvin, male Doctor and lecturer, early modern history.

> "Having read the second material, the footnotes and the bibliography of secondary material is one way of identifying where you might find that original material" Edward, male PhD student and lecturer, modern history.

Reviewing literature is usually the first thing to start with when conducting a research to explore the state of previous knowledge, and what have been done in a certain area or field in order to identify the place that research would be grounded on or start from. One more way of initiating research is searching archives' catalogues to identify a list of references in order to look for:

> "I like to start with the catalogues as the starting point" Lucy, female PhD student, early modern.

> "Well what I'd do, initially, I would search the hard copy of the catalogue in the Archive" Tomas, male PhD student, early modern history.

> "What I tend to do is going for maybe 2 hours to look at the catalogue to then identify the list of sources and then think about which of those I need" Edward, male PhD student and lecturer, modern history.

Because catalogue reflects the whole contents of archives, it plays an important role in exploring and identifying sources. These opening activities that historians performed are

focused on exploring their areas by searching the literature and identifying a route for their research by picking up some references to look for:

> "Result can leads into an identification of further ISB what do I do next? What else sources do I need in the context of these source so far? So it then just opens another channel, does not it?" Edward, male PhD student and lecturer; modern history.

Indeed, the initial identification of what is needed would lead the next activates of ISB and the next stage would be devoted to pursue information or a list of references identified earlier as explained in next stage.

Following information

Following information is the second stage of ISB of historians. They already identified some references or titles of primary sources from secondary sources or picked up from catalogues. In the first stage (identifying needs) historians were working with literature and secondary sources, while in this stage they seek primary sources. Searching and browsing catalogues is the very common way to locate primary sources. This activity can be done online or by visiting archives:

> "The most frequent way is when I search the on-line catalogue of the National Archives (formerly the Public Record Office). Learning about the range of sources that are available for a particular subject helps to extend the issues that my research explores" Calvin, male Doctor and lecturer, early modern history.

> "I just search online, search on the Gill Group Newspaper Catalogues" Tom, male PhD student.

Looking for sources in catalogues can be approached directly especially if titles are known. However, in another case where the needed information is not written in records (oral history), historians try to locate their sources using different method such as advertising or contacting key individuals in the field:

"With regard to my oral ... I put adverts, as such, I got small articles about my research placed in the local newspaper in Surrey which gleamed me a lot of people that were quite eager to either pass on interviews or even as in one case, further minute books" Dave, male PhD student, early modern history.

"Reading the secondary literature where it had been mentioned that certain individuals had been involved and obviously I was aware of the club cricket conference from my previous work ... that was just finding the website for organisation, getting the e-mail address of the secretary and e-mailing him" Dave, male PhD student, early modern history.

In history, many sources cannot be located in archives or online such as in oral history or special collection of some organisations or individuals. For example, in the case of Dave, interested in the history of cricket, his information sources was held by an individual that Dave met where this person lend Dave minute books that worth hundred and twenty year of history. Following and locating primary sources in historical research could be much difficult and different from other fields where plenty of sources are available online:

"It start relatively systematically in identifying geographic area and going to them to be able to look at the material out, so a quite a lot of travelling up and down the country" Anabella, female PhD student; early twentieth century.

Following information and sources in historical research can be both time and effort consuming, especially that not all archives has digitised their primary sources. It was very convenient to historians to search online catalogue and access their primary sources online. However, if primary sources were not digitised and historians had to visit archives to access their sources, they were required to arrange their visit with archivists:

"You really need to know that you can access these sources on that day therefore you need to liaise with the archivist and say I will be coming on this day and this is the source I would like please otherwise you maybe put lots of stress on the archivist" Edward, male PhD student and lecturer, modern history.

"I put more preparation [on] going into the Archive" Tom, male PhD student.

All these kind of arrangements take place before accessing primary sources in order to ensure that required sources are available when visiting archives.

Accessing

All the previous activities (identifying needs, following information and locating primary sources) were done for the sake of accessing primary source; the third stage of ISB. Historians prefer accessing and using original primary sources (this issue has been already discussed in chapter 3), which means that there is nothing stands between them and records or people who created these records:

> "I think part of the fun being historian is actually rolling your selves up actually and having ... when you see these original mini books with lovely, you know, hundred and fifty year old handwriting, just more personal to the people that might end up writing about" Dave, male PhD student, early modern history.

> "I would always want to look at the source in the flesh if you like, before digitising it, so I can get a grasp of what is in there" Tomas, male PhD student, early modern history.

Accessing original primary sources gives historians the feelings that they are in a direct contact with history, adding that in some cases accessing original sources is essential to historians who are interested in the physical features. Accessing original sources in archives means that historians can see sources in their context, which helps knowing lots of contextual information and exploring the relationships between sources:

> "In history sometimes it is very interesting especially when you are using a newspaper not just to have the article from the newspaper, but the page from the newspaper because what is on the rest of that page maybe [related]... which you would not necessary pick up in the digitised version because you are looking for a specific search parameters so therefore a page in newspaper can also give you a contextual understanding" Edward, male PhD student and lecturer, modern history.

"A lot of the archiving material that I use, there is only one copy of it and therefore you need to see it within its historical context, you know, how often it has been used, what precedes it [and] what follows it" Tomas, male PhD student, early modern history.

"I don't just go to the sports page, I have to read the whole paper because you never know where something is going to crop up and a lot of good stuff regards context and attitudes are written not in the cricket columns, but they're on the opposite page and you would miss that I think digitally" Dave, male PhD student, early modern history.

Accessing sources in their context is valuable in terms of gaining the contextual knowledge that is essential to truly interpret historical events, exploring the relationships between sources, and maximizing the chance for serendipitous discoveries. Unfortunately, this context is not available when accessing digitised sources because archives do not digitise everything, and when searching online; the retrieved sources are separated from their context. In turn, accessing original primary sources embedded some difficulties:

"I have had [an] experience of making a trip [to an archive] and someone else was using it [the required source]" Julia, female Prof, early modern history.

"I had one year in particularly where I was frequently going away for 3-4 days of time to collect material and then go back again" Anabella, female PhD student; early twentieth century.

Obviously, historians were entitled to travel between archives in order to access primary sources. Considering any potential risk regarding the availability of sources, as in the case of Julia when she travelled to one archive to find that the source that she wanted was already in use by another historian; they needed to arrange for their visit as mentioned previously. However, if primary sources were available in digitised format, this task would have been quicker, easier and much more convenient to historians:

"Well I suppose just to mention how useful a lot of these digitised sources are becoming for historians" Stephen, male doctor and lecturer, 1850s and 1930s history.

"[Digitised sources] are really useful and that allows you to do things much more quickly and much more easily than you might have done before" Katie, female doctor and teacher, medieval history.

"That is information that you can access all the time and I find that really useful" Lucy, female PhD student, early modern.

"I think to be honest the main advantage of digital archives is saving me lot of time and money in going to Colindale the newspaper library in London" Dave, male PhD student, early modern history.

Digitised sources offer historians many benefits in terms of having instant and permanent access to sources unlike original sources. Digitised sources are more convenient and save time, money and efforts spent on the way travelling to archives:

"It's very expensive to go and stay in London say, to go to the National Archives" Julia, female Prof, early modern history.

"I prefer to use the digital one because it's quicker and it's free as well" Tom, male PhD student.

Time and money can be crucial especially to students who have limited time and financial sources. Adding that the routine of archive causes some difficulties in accessing original primary sources:

"They do not have long open days they tend to shut 5:30" Anabella, female PhD student; early twentieth century.

"You can go into the archive but all the archives now have a closed door and intercom system for entry, some of them demanding you make an appointment, some of them will let you in as long as you seem like you know what you are talking about" Edward, male PhD student and lecturer, modern history.

"The archives that I'm based at are open three days a week for about five hours a day, which isn't particularly useful" Lucy, female PhD student, early modern.

Apparently, digitised sources are useful for historians in terms of access and convenience; however, the issue is that not all archival sources are digitised and accordingly they have no choice but to seek original sources:

"They are quite a crucial sources to me but they are not digitised at all" Anabella, female PhD student; early twentieth century.

"Most of the archive material I use isn't digitised" Julia, female Prof, early modern history.

Lacking digitised sources seems to be affecting the ISB of historians by increasing the duration of this behaviour that in turn requires more efforts. However, after accessing primary sources, historians tended to reference the source if it is in original status or saving the URL of digitised source:

"Basically I think the first thing to do is to catalogue the source more than anything else before you start reading it or anything else really" Edward, male PhD student and lecturer, modern history.

"I take photos first of the reference number… if I need to look at a source again, I just access the CD or the hard drive" Tomas, male PhD student, early modern history.

"I have got a note obviously the chapbook and it is a contact details if I need to go back just to cross reference something or check a date" Dave, male PhD student, early modern history.

It is very important to keep track of the sources that historians looked at, especially for the original sources. Historians pay more attention to this issue because if they needed to look at

certain sources again, they definitely know where to find them; unlike the digitised sources that can be located easily even if reference was lost. It may seem useless to reference sources before assessing whether they are relevant or not; however, for historians it is useful to consider any potential use of sources even if they are irrelevant for the current task.

Judging relevance

Judging the relevance of sources is an important stage for historians and their decision can varies between: not relevant, might be relevant, or relevant. Historians are cautious about their decision where they reference the sources that they access even before reading them. Historians put in their minds the possibility of needing the sources that they access:

> "Again it is difficult to know over a research period of 3 years whether that source might one day be useful and therefore you need to have some kind of reference to it" Edward, male PhD student and lecturer, modern history.

> "Then come back and usually with package of note from several different places trying to grab with the issue and take an issue and then came back through the notes and pull up the material that was relevant" Anabella, female PhD student; early twentieth century.

Edward always considered the potential use of the sources that he accessed, similarly as Anabella who made so many notes about original sources that she accessed even before judging their relevance to back home with lots of notes to read and made her decision about their relevance. The relevance of a source can be decided by a skim reading, while sometimes intensive reading is required because:

> "Sources can be misleading sometimes and you really have to read very carefully especially things like political meeting" Edward, male PhD student and lecturer, modern history.

> "I do need to read things through and absorb them to be able to know which bit is relevant" Anabella, female PhD student; early twentieth century.

"Have a quick scan of it, perhaps have a little read and then I would take photos of it" Tomas, male PhD student, early modern history.

Then a copy of the relevant primary sources was saved either as a digital (pdf) format if sources were digitised, or printed it out and saved as a paper copy. Regarding original primary sources, historians may order a copy from the archive, or take photos of original sources if this was permitted by the archive:

"I have used digital photography to copy archival material, allowing me time later to review what I have copied – in effect building up my own digital sources" Dirk, male doctor, modern history.

"Archives do appear to be ready to copy sources and send them to you, either photocopies or electronic scans..., which is a great improvement and a great help" Tom, male PhD student.

"If I find a given source, I will either print it as a PDF, so that it will save on my hard drive again... but also printing it and I'd insert it physically, I can't read on the screen, it drives me crazy" Tomas, male PhD student, early modern history.

"I spend a lot of time going to archives where I can photograph... now this would take about thirty or forty thousand images if I wished, it's that powerful" Steve, male Prof, nineteenth-century.

"Even when I've collected paper sources, if I collected the original source, say a page from a local newspaper, sometimes I'll scan that back in and put it in a PDF so that its accessible online, so sometimes I'm creating my own digitised sources in a sense from the paper copy that I collected" Anabella, female PhD student; early twentieth century.

"I just sat and typed out everything that was relevant in whole and just work now from my notes" Dave, male PhD student, early modern history.

These quotes speak about themselves showing variety of methods in which historians saved a copy of primary sources; however, the important issue is how to manage these information and copies:

> "The PDF file and hold it in a subfolder on my computer and index them in a way that I can find them all within that usually by author" Anabella, female PhD student; early twentieth century.

> "If it is PDF saving the actual source or digitised copy of the source into a folder which would be related to primary source... [and] if it is a physical copy, similar to the electronic copy, catalogued [and] put it in a particular folder for perhaps later use" Edward, male PhD student and lecturer, modern history.

> "Sometimes I do tend to lose track of why I have taken a photo of a given source, so at the time it might seem a very good idea, but I don't actually make a point of writing down why" Tomas, male PhD student, early modern history.

Managing and classifying both paper and digital copies of primary sources is very essential; especially for a three or four year research in order not to lose information. Being organised facilitates the retrieve of saved information as in the case of Tomas where he tended to take photos of original sources without writing any notes about the potential of their use. After deciding the relevance of sources and do all the managing procedures, historians are ready for the essential work of analysing, and using information from these sources.

Absorbing

Absorbing the content of sources, or using information abstracted from sources is the final stage and the outcome of ISB in which historians make use of the contents of primary sources to serve their research. Absorbing a source can be done by reading, taking notes, or summarising the contents:

> "Just I tend to read it from cover to cover and obviously I was lucky to have the minute books at home... and just work now from my notes" Dave, male PhD student, early modern history.

> "Writing summary of a source after I have read the source and then forming these summaries into some kind of- if I am having a day of research- as kind of abstract of that day of research... I try to use the source so that having use them that enforce both the

context of the source in the subject that I am study" Edward, male PhD student and lecturer, modern history.

"If I am there [in archive] for three days I need to absorb them [sources] to know where to look next, so I tend to take notes and then come back and usually with package of note from several different places trying to grab with the issue and take an issue and then came back through the notes and pull up the material that was relevant" Anabella, female PhD student; early twentieth century.

Absorbing the contents of a source helps placing the acquired information in the research context by intensively reading and thinking about source. This activity could be done instantly after accessing primary sources, or after collecting the required sources as Anabella stated, or by the end of the day like what Edward mentioned.

By this, the five-stage model of ISB of historians has been illustrated, showing how this behaviour could vary according to the formats of sought sources. However, it is essential to mention that it is not necessary for these stages to occur in line or consequence, rather this depend on what historians need from every stage. For example, one can proceed from access stage to the second stage to follow information that was discovered when browsing the context of a source.

Summary

The ISB of historians has been presented as a part of the results concluded from interviews used in a grounded theory approach. These results revealed a five-stage model of ISB of historians; starting with identifying the sources that they need, and then searching, following, and locating the needed sources. Accessing sources was a critical stage because of its importance along with the difficulties that were involved in accessing original primary sources. Judging relevance was done with more care about any potential use of sources, while the final stage was absorbing the contents of relevant sources and using them in the research context as an outcome of the previous activities.

Part 2: Creativity of historians

Creativity in the context of historical research:

Creativity denotes the production of a new work by the means of discovering a new idea, providing a new interpretation, or constructing a new relationship between unrelated ideas. Historians revealed that creativity means originality. This meaning was frequently expressed by PhD students, to be accompanied with productivity for experienced historians. Though, in few cases it was not easy for historians to articulate their view about creativity, yet the idea that a research should result in a new outcome was always present. In this sense, ISB of historians is performed for the sake of creativity or producing an original idea. Nevertheless, there is no set of processes, or a straight way that certainly leads to creativity. However, the ways that historians interact with sources or information, react to situations, difficulties and accidental discoveries do stimulate them.

Historians were asked to express their view of creativity and the strategies that help them being creative during their ISB. Initially, the topic was not easy for a straight talk and few of them were unsure about what to say, but luckily this uncertainty did not last for long. Based on the results of interviews, strategies to stimulate creativity can be classified into these categories:

- Redirecting research;
- Sources;
- Thinking;
- Interaction; and
- Inspiration.

Each of these strategies is explained in details and supported with examples from historians' talk.

Redirecting research

Redirecting research is one strategy that historians approach to stimulate creativity. It denotes the adjustment of research context to fit the information needs, research purpose, or time schedule. Redirecting research varies in type where often it is necessary to narrow down a research, or to make it wider. Sometimes it is applicable to create a link between two different areas or ideas. Narrowing down a research is helpful in reinforcing both creativity and productivity because focus is existed, therefore a research will be easily managed:

> "...the reason that original idea has been gradually diluted into something a lot more specific is because the project was too big to start with ... I am not sure that is creativity in the direction of my research has gone covered by archive particularly I think it is reducing the parameter of the research into something is manageable" Dave, male PhD student, early modern history.

In many cases, adjusting the research context occurs in an early stage because historians usually start with a wider context where the state of knowledge about new topics is low, and by time they react to new discoveries, situation or difficulties by narrowing down the context:

> "Sometimes in my research a situation determines that I have to be narrow in my approach and my outcomes" Wilson, male doctor and director of research.

What was interesting in the historians' way of narrowing a research is defining a point to focus on and then working backward or forward. In another words, the starting point could be a source that holds evidence in order to elaborate an argument around it, while others do the opposite when searching for evidence to their argument or hypothesis. While narrowing a research helps being focused, a few historians would construct a broad context. This may due to their ability of managing a wide research context adding that research purpose would be satisfied with a broad context:

> "The book that I'm just finishing now... which is a book about the Channel Islands, about Jersey and Guernsey and the other islands in that group, it is original, and it is distinctive in its interpretation because of the way that it considers the islands in their broader context... So in that particular example, the originality or the insight comes from the contextualisation of the particular study that I'm undertaking" Chris, male Prof, late mediaeval and early modern history.

Broad research context fits the purpose of writing a book, yet this was the only case. Being different is what he looking for by avoiding the easily accessed sources. Accordingly, he does not prefer digitised sources to work with because they are widely accessed and according to him the chance of finding original ideas in there is very limited. Another way of adjusting a research context is creating a tangent between two different ideas, which refers constructing or discovering a new relationship where it seems there is not any:

> "I think for me the first stage is collecting together facts that haven't been collected together before" Anabella, female PhD student; early twentieth century.

> "I am currently researching the link between youth cultures and politics in the 1970s and 1980s" Robert, male Doctor and reader, twentieth-century.

> "I'm trying to look at connections between cultures, attitudes to how you should live and family size" Stephen, male doctor and lecturer, 1850s and 1930s history.

As historical research is different by nature (source-centred research) and concern (on past events), inventions are unlikely to occur as in many applied fields. In history it is not applicable to invent objects, but it is applicable to create relationships that help constructing a picture or interpreting a new story:

> "With history is of course you can't invent anything, so being creative takes, I think, a slightly different form and for me, I think it comes by making connections between things" Tom, male PhD student.

> "...part of it is about creating links between different kinds of sources" Katie, female doctor and teacher, medieval history.

Deliberately, historians try to make connection between sources or events to interpret an original story. Meanwhile there is another type of connection that occurs by accident. It may happen to come across a source, talking with colleague, or listening to a programme where

one knows a piece of information that currently seems not attractive or does not stand by itself. Until another occasion comes with something looks related to what was known before. This unintentional linking up causes an idea to flash in mind or help in constructing a comprehensive picture:

> "...So that kind of linked up with what I'd been thinking about and so just reading an ordinary book, you can begin to pick out little bits of information that then link in with other things you know, to make a bigger picture I suppose" Julia, female Prof, early modern history.

Unintended gathering of information may happen in different periods of time, which sometimes causes difficulties in retrieving the sources or reference in case of chasing this idea further. Cognitive processes take place unconsciously to link up these pieces of information to sparkle later as one unit, unlike another type of linking where it leads far from a topic currently under interest to another:

> "You start off looking for something and then it links you up to various other things" Julia, female Prof, early modern history.

> "So I thought that would be a good topic, let's think about working class gambling... gambling led me to policing" Steve, male Prof, nineteenth-century.

> "I could compare how much people were earning using other information from a different data set" Stephen, male doctor and lecturer, 1850s and 1930s history.

Interestingly, historians denote two kinds of linking up: one is structural; and the second is sequential where serendipity plays a good role. However, creativity does not always depend on serendipity; it is a result of working strategies or methodology:

> "I always think historians' methodology is ninety percent science and theory a ten percent pure good fortune" Chris, male Prof, late mediaeval and early modern history.

Regarding the fact that more than half of historians acknowledge the role of serendipity in stimulating creativity; IRS is entitled to support this feature:

"I think there's a lot of serendipity in this" Steve, male Prof, nineteenth-century.

"I have been fortunate in being able to access closed files for a specific project" Wilson, male doctor and director of research.

"The main creative act is to allow the research to stray a little and discover serendipitous holdings which may be of use now or later" Frank, male Prof, modern history.

Usually IRS is evaluated for its accuracy of coming back with what is asked for and dismiss all that irrelevant. This is definitely the main principle of IRS; on the other hand it is also helpful to acquire the sense of reality:

"Fuzzy logic and serendipitous functions which would reflect what is taking place in a real archive" Frank, male Prof, modern history.

"Research is at its most creative when the results exceed the question" Frank, male Prof, modern history.

"My projects tend to be much broader than that. So I've never done anything that has quite such a narrow … unless it's absolutely clear what you need to read" Julia, female Prof, early modern history.

Having these kinds of fuzzy results is stimulating, especially in an early stage of research where unexpected results can be interesting and a very useful point to start with. New discoveries could influence the research context and sometimes change its direction in a way that supports creativity. In essence, creativity is a strategy of working and dealing intellectually with sources and situations that occur when doing research. Yet this strategy is

not enough, what historians need is the sources that support their arguments and interpretations. So another way of stimulating creativity is accessing a wide range of sources.

Sources

What makes historical research is different from other field of research is being sources-oriented research. It is heavily constructed upon existed sources. Historians use a wide range of sources to help them telling a new story about the past. Historical sources can be primary or secondary. In turn primary sources can be found as published/unpublished sources, visual history and oral history. Having a wide range of sources available to historians stimulates their creativity in the way that they provide diversity of information:

> "Access to archives/sources can stimulate activity and thought processes, and so thereby stimulate creativity. So having access to a range of sources is important" Robert, male Doctor and reader, twentieth-century.

> "Kind of creativity comes from seeing a primary source or a secondary source or something like that" Lucy, female PhD student, early modern.

Regarding variety of sources and their intellectual value to historical research, it is surprising that not all of these sources are easily accessible and not all of them are available online. Historians appreciate using digitised sources; indicating that convenience and online access drive them most to seek digitised sources, in turn, for many of historians there is nothing can be compared to accessing originals. In turn, going to archives consumes researchers' time, money and effort adding that they suffer from routine in archives. Yet using originals is still an essential way of stimulating creativity:

> "I think it has been a benefit for my work to do it the slower way and I think that is probably help to my creative thinking and give me ideas rather than digitised" Dave, male PhD student, early modern history.

> "It's from accessing original sources... that stimulate a sense of creativity" Robert, male Doctor and reader, twentieth-century.

In many cases, it is necessary to look at original sources, especially when historians are interested in physical features, adding that going to archive would give the chance for random discoveries by browsing shelves and exploring the context of a source. Also, seeking the rarely used sources increases the opportunity for new discoveries. It could not be easy to assess how many times a source was used; however, some historians have their own strategies in finding sources that are used less such as; not relying completely on IRS of digitised sources and searching in unknown archive:

> "I am possibly the only one or one of three or four people who have ever looked at them" Steve, male Prof, nineteenth-century.

> "I do not like archives that are easily accessible or commonly used because it is very unlike that anything original or difficult is going to emerge from them" Chris, male Prof, late mediaeval and early modern history.

They just make the process more difficult to make sure of coming up with an original idea. Avoiding digitised sources, looking for sources written in old or foreign languages, or sources that are restrictedly accessed such as personal archives may help in this approach to stimulate creativity. Moreover, a lucky discovery may lead to rare or unused sources.

Thinking

Thinking about research question, method and sources is another way of stimulating creativity. Historians' way of thinking varies in type according to their philosophy and background where they reveal three types of thinking: innovative, conceptual and critical. Innovative thinking reveals generating new ideas or new way of approaching things. In this context, generating a new idea is supported by seeking unused sources:

> "My research approaches are designed around what are intended to be innovative or distinctive projects. So they tend to be requiring access to the sources of material that others have not used before…" Chris, male Prof, late mediaeval and early modern history.

Sometimes it is not easy to find unused sources especially that searching process may take long time, which is not applicable when time is restricted. In this case thinking about new approach of using source or different way of interpreting a story seems more valid:

> "Essentially I was working backwards I don survey of cricket supporters and they declared a certain meaning for cricket" Dave, male PhD student, early modern history.

> "Recently I have been working on how a particular military term (fencible) became popular as a description for a type of military force in the late eighteenth century. To do this has required a different approach to the records I have used before (War Office records in the National Archives, Kew) to trace the emergence and development of this word, rather than focusing on what the sources tell us about the running of the British Army" Dirk, male doctor, modern history.

Thinking conceptually helps stimulating the creativity of historians by making connections between sources, ideas or information to construct a new story or interpretation of past events:

> "I suppose that creativity means re-conceptualizing an issue: seeing a subject in a new way" Calvin, male Doctor and lecturer, early modern history.

> "The past has to be reconstructed in our minds: that part of history is creative and subjective" Calvin, male Doctor and lecturer, early modern history.

> "You've digested a lot of ideas... and then suddenly, you know, you can start writing and it all, it will all come" Julia, female Prof, early modern history.

Another type of thinking is the critical one in which analysing and evaluating information and arguments are sources for original ideas:

> "The basic argument of the middle classes is that gambling led to poverty and I argued the way round" Steve, male Prof, nineteenth-century.

What helps historians with this type of thinking is asking questions, arguing preconceptions, comparing, and working with controversial areas in order to see what is not usually visible:

> "I especially like controversial topics and approaches because they make me think" Jean, female Doctor and lecturer, late medieval and early modern history.

> "Comparing them and contrasting them with each other ... can spark ideas in your head" Lucy, female PhD student, early modern.

Thinking creatively is not just a character; it is a strategy that enables people to deal with situations and making use of information that they have. Obviously, people do not act similarly because each has his/her own background and style of thinking, likewise historians; everyone can interpret a different story or look at a source from a different angle. This is the subjective flavour of creativity that should be shared or integrated together to comprehensively view the past. This leads to the role of interaction in stimulating creativity.

Interaction

Interacting as a method of sharing information varies in type between formal (affiliate and organised by formal institutes) and informal (casual way of interaction; it could be a daily talk with colleagues or friends). Historians may seem isolated in doing research, yet they consider talking with others as a way of stimulating their thinking and inspiring them further:

> "So I suppose the generation of ideas is part of creativity isn't it and whether that happens through talking to people" Julia, female Prof, early modern history.

Historians show three levels of interaction: High, moderate and low. In some cases, historians may feel isolated because it is rarely to find researchers or PhD students who belong to their area of interest, adding that doing research is an individual work:

> "I think the big difficulty there, well particularly at PhD level, is actually, the difficulty of

finding someone else who's working on something similar" Tom, male PhD student.

Some historians found interaction with others as a good opportunity to stimulate their creativity and open up their thoughts:

"What has been very helpful with regards bouncing ideas of people is sharing the office with people from others doing PhDs" Dave, male PhD student, early modern history.

What was interesting is the idea of interacting with people who have different backgrounds and interests. The value of interaction comes from increasing or changing the state of knowledge that one hold. Interacting with people from different fields supports this statement because similar people keep themselves inside the same box, while different people help thinking outside this box:

"The thing has led me to think of other routes for my research has been interacting with other academics from different fields primarily, rather than an archive" Dave, male PhD student, early modern history.

In essence, interaction should not be restricted to people who have the same interest. In turn, people may look similar, but still different in their thinking and interpretation. Subjectivity makes different flavours of views and perspectives, so interaction is more likely to open our thinking in someway:

"It's all part of what you're doing and you're kind of building on your own research and your own work and I think you need other people, otherwise academia is not really worth doing" Lucy, female PhD student, early modern.

Some may find that there is no point of interacting, especially that their research is based on individual tasks, while others prefer the interaction to be in a formal context; such as in conferences or seminars because their interaction then would be based on the works that had done or already published:

> "My desire is not just to find information, write it on paper, I want to share it out there and so I have done several conference presentations" Anabella, female PhD student; early twentieth century.

> "When we get together in expert groups it is usually to discuss findings (conferences, seminars, etc.) rather than how we got there, advice and thoughts about approaches" Dirk, male doctor, modern history.

Preferring the Interaction in formal contexts could also indicates, to some extent, that historians are cautious about sharing ideas and perspectives, especially if they are not published yet in order to protect their original ideas:

> "People are not necessarily going to want to speak to somebody else, because you know, it is their research and they don't want to, you know, you can feel threatened if someone's working on exactly the same kind of thing". Julia, female Prof, early modern history.

This sense of protecting original ideas could prevent some researchers from talking about them at least in early stages. Nevertheless, talking to others, formally/ informally, encourages the circulation of ideas and helps thinking outside the box, which in turn contributes in stimulating creativity or inspiring the research further.

Inspiration

Being inspired by others' (works, perspectives, or talks) stimulates creativity in two ways; either by imitating them in some aspects or by completely doing a different thing:

> "The availability of other authors' historian works is obviously essential to any study" Edward, male PhD student and lecturer, modern history.

Knowing other researches' structure and methods would stimulate thinking about research design. It happens to borrow a methodology from other fields to help being distinctive. The

creative thing here would be in making balance between being relevant, but distinctive. Thus accessing a wide range of others' works stimulates the production of new ideas:

> "How I came to this (in retrospect, self-evident) point was through reading more widely in secondary works, which in turn promoted me to reinterpret the key primary sources" Calvin, male Doctor and lecturer, early modern history.

Supposing that knowledge is constructed by individual researchers, this construction is done in sequences where current research is stimulated by earlier ones. Individual researches are inspired by previous works to bridge gaps, do further investigations, criticise or generate different interpretations.

Summary

In this second part of interview results, creativity has been presented in the context of historical research. Historians revealed different strategies to promote their creativity during their research. They redirected and amended their research in different ways to encourage the production of original outcome either by narrowing down, extending, or connecting two different ideas or areas. Having a wide availability of sources to access is another thing that stimulates their creativity. Further, type of thinking (innovative, conceptual and critical) approached by historians was said to help being creative. Interaction with other researchers from the same field or different disciplines, formally or informally, helped opening up thought. In the same way, historians were inspired by others' works in conducting research and producing original ideas.

Part 3: Enhancing IRS of digitised primary sources

This part of interview results presents different areas to be enhanced in IRS of digitised primary sources as expressed by historians. Historians were asked about difficulties faced when using digitised source, and features that they would like to have in an ideal IRS.

Integrating historians' talk about these areas helped introducing several approaches to enhance IRS of digitised sources. Based on this, the enhancements are categorised in eight areas presented as:

- Searching facilities
- Metadata
- Digitised sources
- System
- Training
- Interacting tools
- Profile
- Professional assistance

Next will be a demonstration to each of these categories in details supported by excerpts from historians' talks.

Searching Facilities

One of the main drivers that make historians seek digitised sources is being able to search and access sources conveniently at a fingertip. Searching facility varies in type between general and advanced which is reflected by the system's contents and targeted users. Developing searching facilities entails IRS of digitised sources to support serendipity, advanced search, chaining search and ultimately text search.

Support serendipity

Usually, a research begins with general query where historians browse to explore the research area and clarify information to be familiar with their topic. Doing general search or browsing was approached because the information needs were not so clear or the research that historians carrying out was not experienced before:

> "Well how do I look for information, well to start with, that general question" Stephen, male doctor and lecturer, 1850s and 1930s history.

"I have never done anything that has quite such a narrow, well quite such a specific focus as that, unless it's absolutely clear what you need to read" Julia, female Prof, early modern history.

The importance of this type of search comes from being associated with serendipitous discoveries that end up with historians in certain area that was not sought in the beginning of the search:

"Research is at its most creative when the results exceed the question" Frank, male Prof, modern history.

"Finding new sources, especially regarding things I haven't thought of certainly helps" Danny, Male PhD student.

"I am researching the punishment of heretics through the forfeiture of their property. Discovering that there are sourced law suits in which relatives brought legal actions to recover this property has shaped my research" Calvin, male Doctor and lecturer, early modern history.

Despite the benefits of accidental discovery of sources and information, this type of general search is time consuming and not very supported in all IRSs of digitised sources because archives did not digitise all of their contents where historians miss lots of sources when searching online:

"Online and computer based research can only provide this serendipity at great time expense (i.e. browsing far and wide)" Frank, male Prof, modern history.

"This loose linkage is difficult to research in computer based searches" Frank, male Prof, modern history.

"This is often the case when one comes across new sources, not usually digitalised, which have only just been released, as they can alter/affect one's stance and pre-determined ideas" Wilson, male doctor and director of research.

"In normal library-based work, there is a recurrent serendipity that arises from finding previously unexpected materials bound into the same volume" John, male Prof, early modern history.

As browsing leads to serendipitous discoveries in the initial stage of ISB, it is also essential in later stage when accessing primary sources to explore the context of these sources and generate contextual knowledge that helps understand the circumstances around sources. This rises the historians demand to support the serendipitous discovery or fuzzy search in IRS of digitised sources:

"Fuzzy logic and serendipitous functions which would reflect what is taking place in a real archive" Frank, male Prof, modern history.

Structuring loose links between digitised sources and not overweighting preciseness to comprehensive of recalls enables the valuable discovery of information that in turn feeds the creativity of historians. In turn, historians need to perform a search in a more structured way to locate certain information or sources.

Featuring advanced search

Usually, doing a general search does not help historians when they look for specific sources or certain names in a particular period of time. Ending up with wide range of results do not assist historians' research, where they have to spend time repeating search and trying different search queries:

"Because I am searching on names and usually if you put them on Google there is thirty or forty who are totally the wrong people you do not want to look at, so that is not often a very satisfactory way for me at all doing general search" Anabella, female PhD student; early twentieth century.

"You either get thousands of results or none at all" Tom, male PhD student.

Even though some retrieval systems allow historians to feature their search term in an advanced level, there is still a need for more search fields that help defining search term or query:

> "Sometimes when you going to an advance search the actual facilities available in an advance search are actually quite limited" Edward, male PhD student and lecturer, modern history.

The point is that searching facilities are required to cover all historians' needs and take in consideration the special attributes of sources. In other words, designing advanced search should allow historian to define his/her search in terms of subject, author, gender, period of time, geographical place, type, and format of sources. Also it would be stimulating if it is possible to make connections between two areas or two periods of time in one search query:

> "Some databases for early modern history – for example, the Survey of Scottish Witchcraft – enable scholars to manipulate collections of information" Calvin, male Doctor and lecturer, early modern history.

Having the ability to look for two terms or searching keys supports the creativity of historians, especially their strategy of linking two different areas. Thus, more detailed fields that define a search query contribute in acquiring related sources quickly. By this, historians have the option of making broad or focused query:

> "So we can search as targeted as possible, so fields that can be limited or widened, keywords which can be truncated etc." Jean, female Doctor and lecturer, late medieval and early modern history.

The main idea standing beyond this is to manipulate search query and control the type of information that a search is supposed to yield to assist the historians' search and increase their productivity by saving both time and effort.

Chaining search

Chaining search denotes the idea of visualising the relationships between sources and enables

historians to follow these relationships to discover other sources they did not intend to look for or they did not know about before:

> "It refers to, relationship to other sources" Dirk, male doctor, modern history.

Chaining search can be backward by showing who used this source, or forward by suggesting related sources. Forward chaining gives the chance to explore related sources that historians are not aware of:

> "It would be quite handy if it could suggest to you perhaps sources that might be relevant as well" Tomas, male PhD student, early modern history.

> "Therefore a 'smart' retrieval system that points you in the direction of related sources would be worthwhile" Danny, Male PhD student.

However, the critical issue here is related to the method of building this relationship and who set these types of relationship and how:

> "When archives offer a more targeted approach; material is in the box that should not be there but it is related to what the box is meant to contain either by personal or bureaucratic links" Frank, male Prof, modern history.

Clearly, archivists have good experiences in dealing with historical sources and introducing them to historians in a proper method. Yet, enabling historians to take part in these processes, either formally or informally, would make them more sufficient in meeting historians' needs. Because historians' way of thinking is different from archivists' and the best would be to integrate both experiences.

In the same way, backward chaining helps historians to know who used a source and how this source has been used:

> "I think it might be quite useful to, perhaps even to show where the source has been used" Tomas, male PhD student, early modern history.

Upon this historians may use this source in a different way from others or investigate further about it in the light of previous use. Moreover, from source citations historians may indicate the popularity of this source or not:

> "Which allows you to look at a popularity of particular texts" Katie, female doctor and teacher, medieval history.

Linking this back to the historians' strategies of stimulate creativity, knowing how many times is a source was used supports the strategy of working with rarely used sources and avoiding the source that has been cited a lot. What is important also for historians in terms of searching facilities it being able to search the text of sources.

Text Search

When sources' texts are not searchable, historians have to read the whole source and it happens to find that this source is irrelevant after spending time reading it. When digitising a source, scanner produces a digital image which its content is not searchable:

> "Often times they are just photographed or on a PDF which does not have that search facility and therefore you know that means they are not much different than the original source because you are going to do the same process you are going to have to read all that source to find the key word just as you are with the original source" Edward, male PhD student and lecturer, modern history.

This statement of Edward outlines the situation where historians feel frustrated when they cannot benefit from searching facilities to avoid reading the whole source. Especially when their research concerns the development of a certain term:

> "Recently I have been working on how a particular military term (fencible) became popular as a description for a type of military force in the late eighteenth century. To do this has required a different approach... In essence, I've been undertaking a manual keyword search through sources, and then copying them for more detailed examination later on" Dirk, male doctor, modern history.

Once the texts of sources are applicable to perform a word search, the productivity of historians will increase by saving their time and effort. This can also be drawn upon the various types of searching facilities that were mentioned previously. Accordingly retrieval systems should be supplied with good searching features that allow historians to thoroughly search for sources, visualise relationships between sources, and searching contents as well. However, these improvements cannot be achieved if they are not supported by other components of IRS such as providing rich information about sources (Metadata).

Metadata

Metadata, information about information, plays a principle role in introducing and retrieving digitised sources, essentially because historians need to know more information about sources when searching virtually. In some cases, historians are interested to know about the physical attributes of sources (type of paper, ink, colour, paper conditions). Extra information about sources is required sometimes to inform if there are any annotations on the back of sources, and whether these annotations have a different type of writing. Such information stimulates the thinking of historians. Unlike the case of direct contact with original sources, there should be a sufficient description of sources to compensate the historians' feeling of not being in touch with the real piece of past:

> "So it can be quite frustrating actually to try to use because it doesn't provide all the information that you might want and so I think one of the issues that has to be thought about very carefully at the beginning of these projects is to think about who's going to be using the material and what information is it that is going to be most useful to the biggest range of people who might possibly use it" Katie, female doctor and teacher, medieval history.

Missing information about sources can be frustrating because of its importance to understand the context of sources. Having a sufficient description about sources with adequate abstract reinforces digitised sources as a good alternative to originals. Concerning the area of metadata entails enhancements to catalogue, index, and abstract as explained next.

Catalogue acts as an entrance to the contents of archives and libraries. This requires catalogue to be accurate and inclusive in order to represent the whole contents by providing standard descriptions:

> "I like to start with the catalogues as the starting point, because that's kind of, it's categorised information, so its information that's kind of bite size if that makes sense" Lucy, female PhD student, early modern.

Having these individual entries for each source helps historians in knowing more about a subject or area. Even if sources are not digitised, online catalogue saves historians' time by deciding what they want before going to archives:

> "Now the catalogue saves you a lot of time because you can order it before you go" Tom, male PhD student.

Going to archive is not that easy task for historians because of its work routine; in addition to the potential that sources could be unavailable, so ordering sources in advance reduces the risk of not finding the required sources. However, talking to historians denotes some problems when using online catalogues such as being incomplete and difficult to use:

> "The problem that I and a lot of historians I think probably have is about the catalogues of archives and the difficulty of searching them online" Stephen, male doctor and lecturer, 1850s and 1930s history.

> "Searching online catalogues can be quite difficult" Tom, male PhD student.

This difficulty comes from not having enough description of sources, and indexing is not exactly reflecting the content of sources, along with not having enough fields to define a search. Another difficulty in using online catalogue is being incomplete. Missing sources from catalogue threats its creditability and make historian feel that visiting archive is the best for them:

"I know from my own experience, a lot of the time, due to time limitations and cost limitations and staff changeover, there are sources that are not in the catalogue that are in the collection" Tomas, male PhD student, early modern history.

In this regard, catalogue should be regularly maintained and updated to match both of archives' contents and historians' needs:

"There is not point having a catalogue that is only partially complete or one that does not work sometimes" Tomas, male PhD student, early modern history.

As mentioned previously, historians need more information when searching virtually; it would be supportive to include information about source's language and type of text, or include a sample of source text:

"when I was studying medieval history it will be important to know whether the source is in old English or in Latin because you may find the source but the serious problem in using that source if you do not speak Latin" Edward, male PhD student and lecturer, modern history.

"You might have the first page of an archival source because sometimes the title of the source and the description doesn't really give you a sense of what you're looking for" Tomas, male PhD student, early modern history.

If there is no place for this information in catalogues, it can be included in abstracts. Some catalogues may have standard and basic fields of information, thus any further description can be added to abstracts. Abstracts will be discussed in a due time, yet now it is essential for catalogue to be based on a good system of cataloguing entries and indexing to guarantee the proper match between key words and sources' contents. Choosing the language of cataloguing and indexing influences search productivity of historians; where it is vital to use the natural language of sources to reflect source's subject and contents:

"I think the closer we can get to something that codes what actually appears in the source, the better, because what we often have now is a coding of something which is a

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standardised version of what appears in the source" Chris, male Prof, late mediaeval and early modern history.

"If I try searching through the online indexing does not always come up" Anabella, female PhD student; early twentieth century.

This case occurs when indexing medieval or late modern names or places where one name could have different versions according to source language:

"So there's a chap called John Afford in England, who when he's in France, he's called Guy de Briugs" Chris, male Prof, late mediaeval and early modern history.

This different use of language or using free-terms that are not from the sources misleads historians and causes them to seek original sources. This initiative act of archivists is not very welcomed by historians because archivists' point of view is different from historians':

"I would like them to stick to being archivists and leave all that process of interpretation to us, because they often get it wrong, because they're not historians" Chris, male Prof, late mediaeval and early modern history.

"Archives are profession to themselves if you like; they have their very traditional systems of indexing" Anabella, female PhD student; early twentieth century.

Usually, archivist's experience is appreciated by historians although this experience may be limited in terms of some analytical processes such as indexing, categorising and abstracting. Only historians know what is essential to them or in which way a source contents can be interpreted. Consequently, it will do well to archives' services if historians take part in the processes of preparing digitised sources.

Abstracting

Abstracting is another service that needs to receive more attention because it acts as surrogate of sources, especially if sources are not digitised, thus historians have the

opportunity to decide what they want before going to archives. Generally not all sources have abstracts, and if there any; they are poorly produced:

> "There are masses of sources so therefore one of the other problem with original source is you cannot just think right I will look at the conservative one and I will read the liberal ones and I will read labour ones piles of source around very difficult to do" Edward, male PhD student and lecturer, modern history.

> "It's just impossible to go through 11 thousand hits" Dave, male PhD student, early modern   history.

> "I recently got three sources from an archive in Berkshire, which when I read them didn't actually help me at all" Tom, male PhD student.

The most common difficulty that encounters historians, when using both original and digitised sources, is not having abstracts or having poor ones. This costs them lots of time trying to assess the relevance of sources; especially that tiles sometimes do not help in giving any idea:

> "There is no abstract usually" Edward, male PhD student and lecturer, modern history.

> "Dull descriptions of what a source looks like and contains are far less useful" Robert, male Doctor and reader, twentieth-century.

> "You have just got a title that is all, to go on. So you have got no information about, so you have to guess really what it is going to be about from the title" Julia, female Prof, early modern history.

> "Summarise everything in that pack within a few sentences" Steve, male Prof, nineteenth century.

Abstracts with dull information frustrate historians and give no help. Historian mentioned that abstract's content is subjective and sometimes inconsistent because it is not written by historians:

> "Abstracts are very useful, but again abstracts are written by someone and therefore they have a limitation as well and subject" Edward, male PhD student and lecturer, modern history.

> "I [would like] somebody who knows the topic [and] write about it rather than just an archivist" Dave, male PhD student, early modern history.

For abstract, to be more effective, archivists should consider, first off all, the nature of historical research along with historians' needs. Some descriptive information may help, but it is not enough because historians need to know more about sources in order to assess whether they are relevant to their researches or not:

> "Historian often has to have knowledge of how the sources were created and how they have been organised to know if they will be able to address the research questions they have set themselves… for example relationship maps of letters (who wrote first, then responded, mentioned in another letter to someone else). These sorts of things could enormously help understand behaviour" Dirk, male doctor, modern history.

Actually, it is not an easy task for archivists to come up with such specific information for each source. In this regard, getting assistance from historians in producing abstracts is valuable for both historians and archives. Descriptive and analytical information about sources (what is the source about? Who create it? When and where it was created?), location and format availability are useful. Information about source's language and text type along with a small sample is supportive as well. Copyright is another important piece of information to state about sources, especially when working with digitised sources to assure historians about source's authenticity:

> "Finding a photograph or things online from various digitised sources I find it quite difficult to more know which one is safe" Anabella, female PhD student; early twentieth century.

> "I mean it would be quite useful to know who's, where it actually belongs, where it is, how it's got there, you know, who's made the decision to put this source in there" Tomas, male PhD student, early modern history.

However, this issue may not concern historians when using digitised sources from an affiliate archive repository. Adding that indicating such information about copyright and source of source may be subject to Data Protection Acts. All these sorts of information about sources help historians gaining knowledge and learning some of the conditions around sources. Furthermore, there is an interesting point has been mentioned by historians in regard of metadata, which is statistics.

Statistics

For historians, It would be inspiring to know how many times has a sources been used? And who cite it. This would support the aspect of originality in historical research and being consistent with literature. Generally, being distinctive requires researches to know what has been done before, which methods have been approached, and how sources have been used:

> "I do not think I have ever known archives publish material on who actually use their sources. But yes to know that there were two local organisations that 20 people had looked at one set of minute books and nobody had looked at other set of minute books would instantly make me look at the one where nobody has, so even just knowing that other people had had it out would be useful [to know] what they thought of it" Anabella, female PhD student.

This type of statistics supports creativity of historians who prefer to work with sources that are rarely used or approach sources differently:

> "Basically to say there are, you know, there are in print these half a dozen approaches to this particular manuscript, not saying that anyone is right, but just saying that this is what has already been attempted in terms of interpretation of that source" Chris, male Prof, late mediaeval and early modern history.

Furthermore, this supports the retrieval system's feature of back and forward chaining by showing citation or visualising relationships with other sources. And in case of having personal profiles or accounts, this may help knowing others' interests and which sources they accessed.

In general, paying more attention to metadata would enhance the IRS of digitised sources by facilitating sources' discovery, retrieval, and categorisation. Providing detailed information about digitised sources promotes historians' researches and increases their productivity. However, what help historians being creative is plenty of sources that are well introduced by IRS.

Digitised sources

The main difficulty that historians face is the limitation of digitised sources. Interestingly, historians articulated the limited availability of digitised collections as a strong driver to seek original sources. However, this issue cannot be solved at once and the best way to overcome this is approaching the accumulate building of online repository, especially that archives cannot digitise their contents at once because digitisation is expensive and time consuming. Adding that this may disturb the archives' services and sources will not be available to use for a period of time:

> "The greatest stimulus for me would be just the increasing of the supply, finding those new sources to put online" Anabella, female PhD student; early twentieth century.

> "Just getting more material online" Tom, male PhD student.

Increasing the scope of digitised sources effectively promotes the productivity of historians and enables them to come over some problems such as remote locations of archives, routine, time and money restrictions:

> "If all Record Offices had their information online it could save a lot of time in needlessly travelling to the office itself" Wilson, Doctor and director of research.

> "You can go into the archive but all the archives now have a closed door and intercom system for entry, some of them demanding you make an appointment, some of them will

let you in as long as you seem like you know what you are talking about" Edward, male PhD student and lecturer, modern history.

Remarkably, the convenience and easy access aspects of digitised source introduce digitisation as the practical solution to most of the difficulties that encounter historians when working with original sources. Therefore it is vital to put a long term strategy when archives initiate digitisation projects, especially in terms of selecting materials for digitisations. Sources should be selected in the light of historians' needs and should also pay more attention in order not to leave gaps between collections or historical periods:

"Local newspapers are such a curial source in themselves the twenties and thirties are particularly lacking" Anabella, female PhD student; early twentieth century.

Moreover, it is essential for archives' strategy to consider both of the challenges and demands of the digital ages where this believe "if it is not on internet, it does not exist" would be true someday. The desire of having everything online does not pertain only to the young generations, accessing sources from a desktop is a concern for all age groups of researchers:

"With my students, you know, they look forward to the day that, you know, all the important primary source material has been digitised and they can just sit in their room and they won't need ever to go out and look at anything in the library" Chris, male Prof, late mediaeval and early modern history.

"Much like I would search a digital repository such as online newspapers or Eighteenth Century Collections Online" Dirk, male doctor, modern history.

Even in archives it is very common to find historians taking photos of original sources to save as a personal digital repository to avoid returning to archives if they needed to:

"you often see historians in archives photographing sources now, it's quite normal and I just wonder whether there isn't an opportunity for that kind of material to be uploaded in some semi-official kind of way" Chris, male Prof, late mediaeval and early modern history.

> "I spend a lot of time going to archives where I can photograph... Now this would take about thirty or forty thousand images if I wished, it's that powerful" Steve, male Prof, nineteenth-century.

> "I do take a lot of photographs in the Archive too, so I can refer back to them" Tomas, male PhD student, early modern history.

If this can say anything, it is the historians, desire to work with digitised sources, and archives should take this in consecration. In turn, there are some historians who feel cautious about digitisation and prefer working with originals. Adding that archivists may look at digitisation as a threat to their jobs; however, they could save their jobs by acquiring new qualification to work with digitised source. Especially that digitised sources need lots of processes that archivists can perform like structuring good metadata.

So increasing the scope of digitised sources comes under the main issues that historians concern. The quality of digitised source is another concern. Essentially, historians require digitised sources to be an exact copy or image of original without any modification that may affect their understanding of the source. These matters have been discussed previously when talking about searching facilities and metadata. Having some translation or amendments to sources may help historians, but only if they are accompanied with originals:

> "That is quite a common problem for Mediaeval and Early Modern historians, the idea that a name is something that will be spelt in very many different ways, presented in different ways" Chris, male Prof, late mediaeval and early modern history.

> "Ideally, going beyond that would be also to produce a parallel translation into modern English, so that people who can't use the Latin or French can use the English" Katie, female doctor and teacher, medieval history.

Such modifications of using modern language, modern font, and translation would be of a great help to historians, especially the young ones whose their experiences are not long or do

not know old and foreign languages. Again it is extremely important for historians to have an accurate copy of sources.

System

Historians criticise IRS of digitised sources for being difficult to use and navigate through; especially when using catalogue and doing research. In this regard, it is important to pay attention to the fact that not all people have sufficient experiences in using internet and doing research:

> "The search engine, for example, for House of Commons Parliamentary Papers, 1700-, is frankly quite unfriendly, and many people find it hard to locate the materials" John, male Prof, early modern history.

> "I mean the National Archives one can be very difficult to use" Tom, male PhD student.

> "Searching online catalogues can be quite difficult" Tom, male PhD student.

When designing IRS, information professionals need to consider that not all people are experts in using internet and doing research, and having a friendly-user and easy-to-use system is much more helpful than a complex one:

> "Simplifying the search systems would be helpful" John, male Prof, early modern history.

> "What would be helpful are systems which are user friendly ... retrieval systems need to be easy to use" Jean, female Doctor and lecturer, late medieval and early modern history.

Sometimes it is difficult to access or download sources if historian logged in from computers with old version programmes. It is frustrating when retrieval systems are not flexible to use with old computers or technologies:

> "You need it to be able to transfer across different technologies, across different, internet explorer, web host platforms and obviously technology at the moment doesn't seem to be doing this, it's working for the technology now and doesn't transfer either forwards or backwards" Tomas, male PhD student, early modern history.

IRS should be flexible and well maintained to work with different types and versions of computers and technologies not only with up-to-date ones. Adding the features that support historians who concern visual aspects like changing font, enlarging text, or twisting images:

> "As you can probably tell, I am a visual learner. I think that information needs to be large enough and bold enough that it can be assessed quickly" Danny, male PhD student.

Original sources sometimes are not that clear and texts may be handwriting or font may be annoying to researcher's eyes. Using software such Optical Character Recognition would help especially with handwriting to read unclear words. This introduces another area to be considered which is training on how to search and use an IRS of digitised sources because historians are not similar in their experiences and also retrieval systems of archives or institutes are not designed alike.

Training

Historians find IRS of digitised sources difficult to use. They face difficulties in doing research, using catalogues and navigating through IRSs. Historians' experiences in using internet and doing search may not be sufficient enough to realise every aspect of IRS. This variety in historians' experiences demands IRS, which is supposed to serve historians' needs and facilitate their researches, to offer some kind of instruction or training to support historians:

> "Training for the archive how to address the archive? What search terms to use? When to use advance search? When to use those kinds of things would be useful, so it might not be the actual materials themselves it just may be the manner the instructions" Edward, male PhD student and lecturer, modern history.

> "A walk-through tutorial at the beginning that you don't have to use, so if you've done it before and you know how to use it, you can just bypass it, but it's there and it's very obvious for people who are coming to it for the first time. I think that would be a very useful thing to have" Katie, female doctor and teacher, medieval history and teacher.

Not all historians had the chance to be educated using internet or trained to use archives or catalogues. Some may build their own experience by doing and practicing different types of IRS. Some may have different backgrounds and have no experiences dealing with archives or how to search historical sources:

> "You compare how I work with the bloke I sit next to who's very good at digital archives. I mean it takes me three times as long to find something as, you know, he's there in a second and knows all the short cuts and things. But I'm not very computer savvy, so it's like everything; it helps to know how to use them to get the best out of them" Edward, male PhD student with sociology background.

> "I mean I'm fifty years old, but a lot of us are perhaps less IT literate than in some other disciplines. The younger historians are better than me of course" Stephen, male doctor and lecturer, 1850s and 1930s history.

Internet literacy in general and historians' ability, in particular, to set a search term, use catalogue and locate what they need in comparatively a short time can be extremely supported if they have been guided by a short step-by-step tutorial. A five minutes video showing how to navigate through system; along with some instructions about constructing a search term could make difference for historians:

> "Sometimes you end up doing three or four different searches before you actually find the source that you want" Anabella, female PhD student; early twentieth century.

> "A simple adjustment of a search term with one comma or one full stop can change the nature of that search and the number of responses to that search and so on and I think that is problematic when you are inexperienced" Edward, male PhD student and lecturer, modern history.

> "I don't know, I mean there are occasions I think where you realise that the term you're using somehow isn't quite right and you have to try and work out what they called it then" Julia, female Prof, early modern history.

> "To be honest, I'm still learning, to be honest I still don't really know how to do research" Lucy, female PhD student, early modern.

Doing research and figuring out a search term or query are principle issues for historians because their search term needs to perfectly match the key words that were used by the system.

Interacting tools

Despite the historians' tendency to work individually, they see interaction with each other, either formally or informally, stimulating. Sometimes it is not very common to meet historians who share the same interest, but it is still inspiring to interact with people from different background as mentioned previously by some historians. Nowadays, Web 2 tools has been accepted and used to a large extent, and the idea of applying such tools in archives has been proposed like leaving comments or sending sources to others. Accepting this virtual interaction depend on historians' social habits in real life:

> "I am a secretary of a society; I am told I am the most active person they have had because every time something comes in, I inform people, it's an information system and I'm trying to get people connected with other societies, so I'm doing that and I don't mind that, I don't mind that at all" Steve, male Prof, nineteenth-century.

> "I definitely believe in a web 2 kind of approach to this, yeah, definitely, because then you can get the diversity of interpretation into the way that the material's presented" Chris, male Prof, late mediaeval and early modern history.

> "I do not use Facebook or YouTube and do not wish to do so" John, male Prof, early modern.

> "Making IRS sociable is a good idea; certainly sharing sources makes sense" Robert, male Doctor and reader, twentieth-century.

Historians pointed to the aspect of sharing sources and perspectives as inspiring tool. Being able to send a copy or recommend sources to each other, and sharing perspectives by leaving comments or feedback on sources are considerably stimulating. This expands the network of historians and inspires their thinking to a new direction that was completely out of mind before:

> "What I have found interesting more recently was actually a recommendation that I was not aware of from one of my colleagues of digital archives" Dave, male PhD student.

> "I have come across sources where I have thought that although it isn't directly relevant to me, I know someone else who might be interested in it" Dirk, male Doctor, Modern history.

"If you see people tagging things and putting comments in or onto a source, that might help you to think about it in a new way, it might send you off in new directions" Katie, female doctor, Medieval history.

Facilitating this virtual interacting through IRS of digitised source would help archivist in updating entries of catalogue and indexes to match the historians understanding of sources based on their comments, tags, or feedbacks:

"Additionally, annotations from users would help ensure the metadata continues to be updated and historical practice doesn't become fixed by a standard set of terms" Dirk, male doctor, modern history.

Tagging sources or photos would help archivist indirectly where tags or keywords can be an effective source for terms to help in indexing sources because only historians can accurately assess what is in sources' contents:

"Tags would allow you to see where there are suggestions for emendations and improvements to the text" Katie, female doctor, medieval history.

Tagging is considered as a new way of publication, but it is still informal and this might be annoying for a while in terms of who controls these massive key words and to what extent they are accurate. This suggests the idea of having individual profiles on IRS of digitised sources. This type of profile would be very helpful if it allows historians to keep history of their research, leave comments on sources, or write notes for further work. Sometimes historians lose important sources and the only way to find them is to go again through the whole research that they performed before:

"I have done a search, that will find a very specific article that's of use and more often that I would download that in a PDF and save it somewhere, after about maybe a year I got fairly systematic about how I was saving those" Anabella, female PhD student.

"It would be good if rather than having to ask you to, you know, when retrieving information, rather than having to ask you to save the source, it saved it anyway" Tomas, male PhD student, early modern history.

This profile or application (Appendix 9) would acts like a personal database and historians would be able to manage it the way they like. They can give some information about their interest for updates or for other historians to interact with them. They would be able also to follow some sources to see who comments on them, who access or cite them. It can be similar to Facebook facilities but for historians:

> "That is quite a good analogy that, yeah, the Facebook of history" Tomas, male PhD student, early modern history.

Moreover, there was a suggestion from a historian where they can be allowed to upload digitised sources to these systems, especially that many historians do photograph original sources when going to archives:

> "A former student of mine and I, we put in a research project quite recently, which wasn't funded, but a key part of it was the idea that there would be a user generated source that we would put up on the web, whereby we would appeal to the community to post material and that was intended to include actual original sources with commentaries that people would actually post up onto the site" Chris, male Prof, late mediaeval and early modern history.

This idea would be very helpful to archives if archivists know well how to invest what historians have of digital personal repository:

> "I spend a lot of time going to archives where I can photograph... now this would take about thirty or forty thousand images if I wished, it is that powerful" Steve, male Prof, nineteenth-century.

Essentially, enabling the interaction between historians themselves and IRS of digitised sources supports historical research and assists the development of IRS. Firstly, this will enable archivists or system designers to understand the information needs of historians by either receiving feedback or by monitoring historians' search strategy. Secondly, historians will be able to organise their sources on their own profiles, share perspectives, and interact with others and build their network.

Professional assistance

In many occasions, historians have mentioned that archivists' experience is not enough by itself because they reflect their subjective knowledge that is completely different from historians'. Archivists' experience is important to professionally address the contents of archives, introduce and organise sources. Yet enabling historians to participate in processing the archives' services assists in promoting these services to best meet the historians' needs:

> "I always think there's an interesting debate between archivists and historians and we're very different people" Chris, male Prof, late mediaeval and early modern history.

Differences in experience, background and perspectives are not existed only between historians and archivists; they do exist also between historians themselves where subjectivity is reflected by their perspectives and experiences. Despite these differences between historians, they still understand the nature of historical sources better than archivists:

> "Although the danger of course is that it is that historian's view and that historian's view is not my view and therefore I still wouldn't trust what that historian said. But I'd probably trust it more than what an archivist would do" Chris, male Prof, late mediaeval and early modern history.

Clearly, this is not an attempt to undervalue the experiences of archivists; rather this is a try to get the best of them by encouraging the cooperation between archivists and historians. However, this assistance can be acquired either informally by getting feedback from historians, or formally by having permanent historical experts to help in processing historical sources. In this context, there is another type of assistance that can be offered to historians, especially the ones who do not have long experience in historical research to help with old and foreign languages. Lots of historical sources are written in old English, Latin or foreign languages, which requires historians, especially students, to request assistance from linguistic experts or translators:

> "The problem that [sources] are not all in English, some of them are in, quite a lot of them are in Latin or French, Anglo-French and so you need individuals with particular language skills to be able to render those into a form which is easily usable by the non-

expert and that's a very expensive thing to do" Katie, female doctor and teacher, medieval history.

If it is not possible to provide a translated copy beside the digitised sources, archives may provide this service on demand. This service may be fairly chargeable, and discounts for students could be applied.

In a word, enhancing an IRS of digitised sources is not just about applying advanced technology; it is much more related to historians and their needs. Practically, these procedures that have been explained in this section might not be promptly applied in a short time; rather they should be applied in an accumulative strategy. In this regard, it is essential to mention the role of archivists and information experts in saving history for future generation. Archivists should not feel threatened by digitisation, yet they should be encouraged by their faith to history.

Summary

In this third part of results, several enhancements have been proposed to IRS of digitised sources. Eight different areas of IRS were a subject for improvements in order to stimulate the creativity of historians. These improvements demonstrated the necessity for advanced searching facilities, rich and accurate metadata, continuous supply of digitised sources, and easy to use system. Providing some kind of training for historians in terms of doing research and formulation of search query was seen essential. Facilitating the interaction between historians and providing professional assistance for novice historians were also explained. Historians mentioned their desire to participate in processing archival services, especially in indexing and abstracting due to the nature of historical research that is difficult to be captured by archivists alone.

Chapter 5: Discussion

Introduction

Previous chapter presented the results of interviews regarding three distinctive areas: ISB of historians, stimulating creativity, and enhancing IRS of digitised primary sources. This chapter aims to bring together and discuss the findings of questionnaire and interviews.

Results of the questionnaire concluded the historians' preference for original primary sources despite the usefulness of digitised primary sources for which a grounded theory came to investigate more about the experiences of historians when working with digitised primary sources. Constructing a theory that is faithful to and clarifies the area under the investigation (Strauss and Corbin, 1990) was the primary aim of approaching grounded theory. Grounded theory assisted the understanding of the phenomenon in term of identifying the issues or factors that impacted the phenomenon and systematically related them in a way that explained the real context. The paradigm model (figure 30) illustrated the theory of enhancing the IRS of digitised primary sources in terms of:

- Casual conditions: that reveal the limitations of digitised sources in relation to availability, context, and metadata;
- Phenomenon: that is caused by the casual conditions in which the necessity to enhance the IRS of digitised sources is emerged;
- Context: that defines the phenomenon and gives specifications to the type of IRS (history), type of sources (original primary sources), and sources format (digitised). These specifications would in turn influence the approached strategies;
- Intervening conditions: that either facilitate or constrain the strategies taken to manage the phenomenon. ISB of historians helps in understanding the issues to be considered by actions. In the same way, identifying the ways that historians approach to stimulate creativity assists in proposing the actions that would stimulate historians. While the constraining conditions are related to the archives' digitisation strategies, financial and technological sources in which digitisation is both money and time consuming. These issues are related to archives' strategies that were mentioned very briefly by historians; obviously because investigating these issues should be conducted with archivists not historians. Regarding the

constraining condition from the view of historians, their cautious about digitisation and its ability to capture everything historians need has been mentioned a few times; adding the experience of dealing with the real thing would be missed in digitisation.
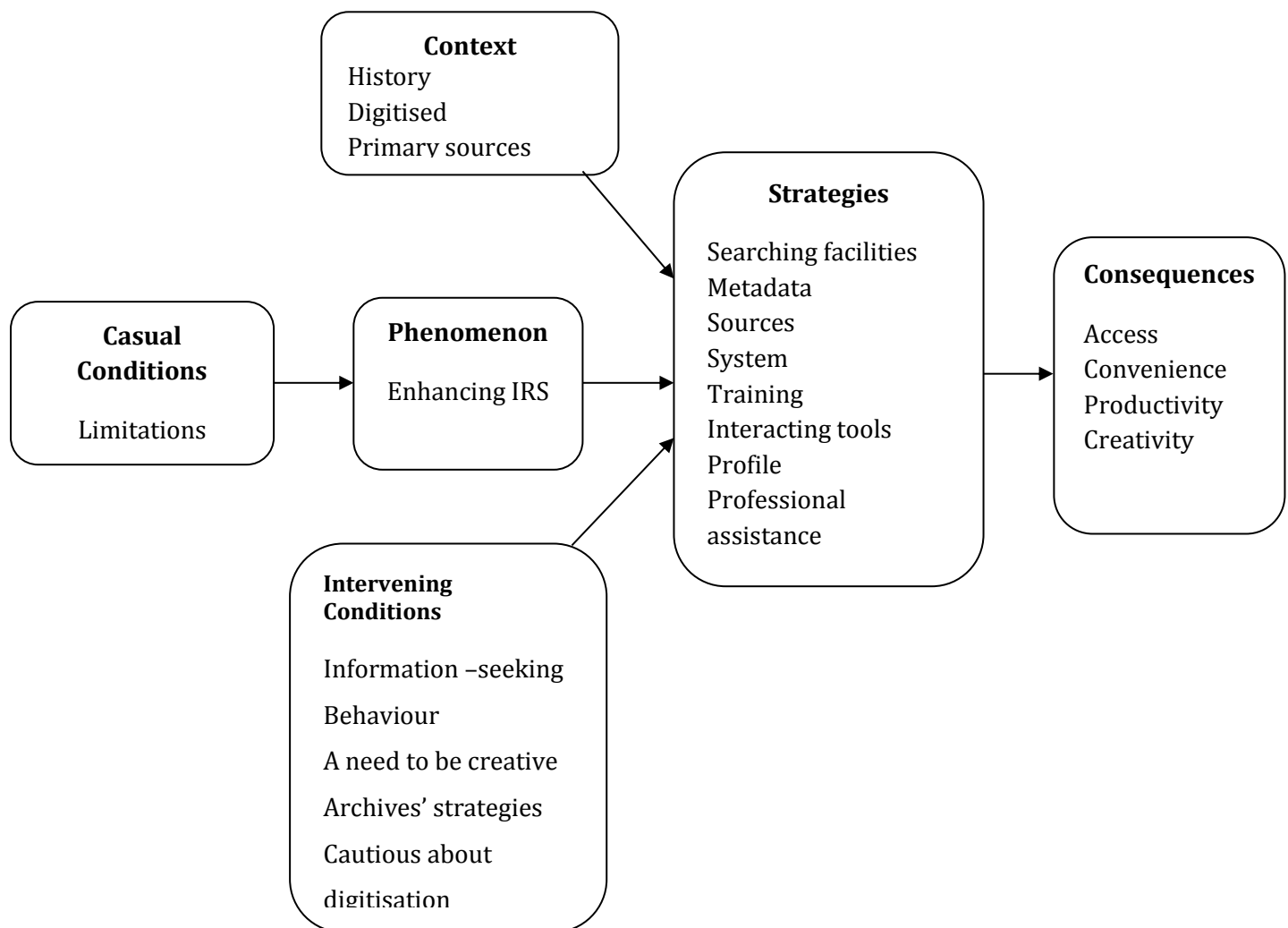
Figure 30: The derived theory of enhancing information retrieval system of digitised primary sources (Author's own)

- Action/interaction strategies: in which actions/interactions are taken in response to the phenomenon. These actions inform the required enhancements to IRS in terms

of searching facilities, metadata, digitised sources, system, training, interaction tools, profile and professional assistance;

- Consequences: of action/interaction strategies reveal the outcomes that might be actual or potential, positive or negative. The desired outcomes from enhancing IRS are continued to be the benefits from digitised sources which are access and convenient use of sources, along with increasing the productivity of historians by saving their time, effort and money. Stimulating creativity is one more essential outcome. However, not achieving these consequences indicates the negative side that might be caused by failing the undertaken actions.

The discussion here is undertaken in details to the main discovered themes: limitations, ISB, the need to be creative, as well as the proposed enhancements.

Limitations

Results of the questionnaire show the historians' preference for accessing and using original primary sources. Predictably, this comes in consistency with the study of Duff et al (2004a, b) because original primary sources offer historians a direct link to history. This enables them to experience the sense of the past and the excitement of discovery, in addition to the legibility, authenticity, reliability and availability of original sources. This attitude of historians did not change since the 1980s, where the studies that concerned the historians' use of information sources were conducted in a time where the printed or original sources were in the lead and the role of technology was not clear (Stieg, 1981; Beattie, 1989), until now (Anderson, 2009, Graham, 2002). However, historians' behaviour witnessed a slight change started since the early of 1990s where they showed an initial positive attitude towards IT (Andersen, 1998; Delgadillo and Lynch, 1999; Graham, 2000, 2001, 2002) and historians started using online archival finding aids (Tibbo, 2002, 2003a; Anderson, 2004) and online sources (Duff and Cherry, 2000; Graham, 2002).

This study reveals a considerable change in the historians' behaviour by considering digitised sources more useful than the originals in terms of online access and convenience. Duff and

cherry (2000) confirmed this finding; though a later study of them came with contrary results (Duff et al, 2004a, b).

Digitised primary sources are most useful to historians, even though they still prefer using original sources. This statement is greatly confirmed by the results of questionnaire to face the fact that IRS of digitised sources is limited in terms of sources availability, context and metadata. These limitations were also mentioned again when interviewing historians in the qualitative phase of the study; along with experiencing difficulties in using and searching online catalogues. In the same way, Andersen (1998) stated the lack of equipment, training, support and information about database as obstacles to the historians' use of technology. Graham (2002) also studied the historians' use of electronic sources to find out that they were not fully cited in research. The reasons for that were lacking knowledge about the online sources, adding that the great respect of traditional sources among academics reduced the potential for citing electronic sources, but not the usage. Similarly, Tibbo (2003b) concluded that introducing and advertising websites and online sources in the academic continuum would gain more benefits; stressing the role of education in facilitating the use of online finding aids and sources by the next generation of historians.

Apparently, highlighting some limitations of the current IRS of digitised primary sources triggered the need to deeply understand the ISB of historians to help enhancing this system, especially that the literature of archival studies lacked this direct concern on digitised primary sources.

ISB of historians

Investigating the ISB of historians reveals a five-stage model:

Identifying need: is the opening stage in doing research. Historians are mostly motivated by interest to work with a topic that is either familiar with or not. Thus, historians initiate a research aiming to clarify their topic and identify key sources to follow. To do so, historians visit archives, search literature or secondary sources, and browse catalogues. This stage,

Identifying need, is named so; A) to mirror the historians' goal of doing this initial search, which is identifying primary sources that they need, and B) To reflect the logic start of an ISB, which is again the information need. Apparently, *identifying need* corresponds with *starting* in Ellis' model (1989) and *initiation* in Kuhlthau's model (1991) where the common aim is to set up the ground for a new research and identify key sources to start with. This stage is very important for historian because sometimes it is very difficult to identify which sources are relevant to a topic that historian have no previous experience in. In this case, historians start their search with some aspects of *uncertainty* (Kuhlthau, 1991) or their knowledge is somehow in an anomalous state (Belkin, 1980, 1981). However, after exploring around their topic by reviewing literature, searching catalogues and bibliographies, and visiting archives; historians become familiar with their topic and some of the key sources. This is what Duff and Johnson (2002) and Rhee (2012) described as the *orienting* activities.

Following information: since the previous stage yields some key primary sources, the task now is to follow information in order to locate where these primary sources can be located and accessed. *Following information* parallels with *chaining* in Ellis' model (1989) where information seeker chases citations and references *backward and/or forward*. In the same way, this stage is seen to be similar to the second stage of Duff and Johnson's model (2002); where historians *search for known materials such as* names, sources or citations that were identified during the initial search in order to access them. However, the combination of the first two stages of the current model (identify need and follow information) matchs *searching* the first stage of seeking behaviour in the models of Rhee (2012) and Meho and Tibbo (2003).

In this stage, there are two scenarios: A) required primary sources are located in an electronic format (digitised) where historians can immediately proceed to the next stage and access them online. B) Required primary sources are located only in archives where accessing is physically restricted to visiting archives. In contrast, scenario (A) is quick and straight, while scenario (B) is associated with problematic issues pertaining to archive location, routine, and source's availability. However, to manage situations in scenario (B), historians contact archivists regarding the required sources in order to arrange for their visit, unless the potential risk of not accessing sources might be high.

Access: is the third stage that is seen as the outcome of the previous stage, where historians located the needed primary sources. Ellis (1989) do not consider access in his information search process, neither do Duff and Johnson (2002), until the research of Meho and Tibbo (2003) perceive it as distinct stage in the ISB, and so Rhee (2012). Meho and Tibbo (2003) realised the problems associated with this stage, which are represented in the current context as scenario (B).

Regardless of the fact that that historians prefer accessing original sources (Hassan et al, 2012; Duff et al, 2004a b), which Smith (2004) considered it as a universal trait of historians, scenario (A) is quicker and more convenient than scenario (B). Historians consider digitised primary sources as the most useful (Hassan et al, 2012), which is supported by their tendency of taking photos of original primary sources in archives to create their own digital sources.

In turn, accessing digitised primary sources prevents historians from *building contextual knowledge*. Historians emphasise the importance of accessing original primary sources in their context to gain better understanding of the record contents, relationships with other records, and to further identify relevant sources. *Building contextual knowledge* is the third stage in Duff and Johnson's model (2002) where historians are likely to identify any names or organisations encountered when accessing sources that following them leads to information that helps in interpreting events or telling new stories.

Indeed, historians tend to browse the context of accessed source because they might accidently find useful information or related sources. Historians indicated the role of serendipity in their research (Delgadillo and Lynch, 1999; Dalton and Charnigo, 2004); however, Duff and Johnson (2002) stated that what seems serendipitous; is actually found on purpose highlighting by that the importance of contextual knowledge. Certainly, the opportunity of identifying relevant sources can be found in each access, and each source can embed potential information about new sources. Rhee (2012) as well included *constructing contextual knowledge* as a distinctive feature of ISB of historians; however this feature was included in every stage of her model; unlike the current model where building contextual knowledge is associated only with the access stage.

Judging relevance: is the stage where historians evaluate accessed sources in terms of relevance to their research topic. This is what Ellis (1989) described as *differentiating* where information seeker decides what sources are relevant and useful. This stage also corresponds with the *assessing* feature in Rhee's model (2012). Noticeably, historians tend to be very cautious in making decision about relevance because they pay more attention to the potential use of primary sources, thus they often make notes and reference accessed sources even before deciding if they are relevant or not. Especially, when accessing original primary sources; where going back to archive to check some sources consumes historians' time, effort and money. Referencing, categorising and storing notes, photos, and sources' copies are essential activates to historians to facilitate their retrieval. Similarly, Meho and Tibbo (2003) include information management in their model because it plays an essential role in promoting information search and retrieval.

Absorbing/using information: is the final stage in which historians intensively read relevant materials, analyse information and use it in their research. Meho and Tibbo (2003) call this stage *processing* where synthesizing and analysing information take place. Historians' methods of working with relevant sources are varied in which reading sources can be done immediately after accessing them, while others leave this task for later; for example when they are in a reading mode. Working from notes is another method that is commonly stated by historians (Case, 1991a). Especially when working in archives where historians tend to take notes and back home to work from these notes. However, when sources are available for a long time, historians tend to read them cover-to-cover. Case (1991 b) considers historians as *Expert User of Text.* Indeed, this stage is purely cognitive in which historians need to read, abstract, analyse and synthesis information in the context of their research.

The proposed model of ISB of historians (figure 31) is unique in the way of highlighting the differences between seeking original and digitised primary sources to inform the enhancements proposed to the IRS of digitised sources. This model indicates four main difficulties:
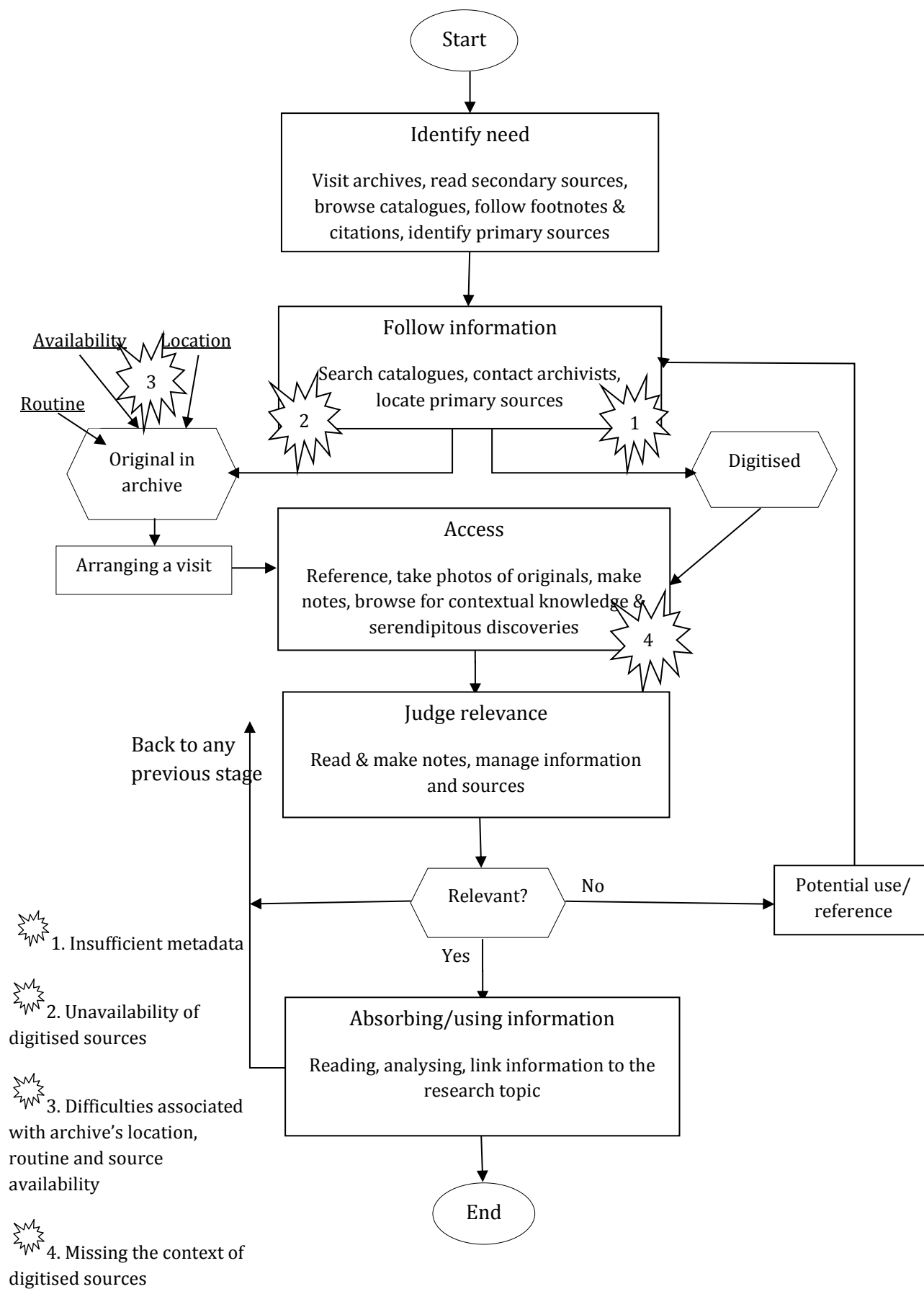
Figure 31: ISB of historians (Author's own)

- Insufficient metadata: this issue is related to both original and digitised primary sources where historians report incomplete and inaccurate information about sources with difficulties in using catalogues;
- Unavailability of digitised primary sources forces historians to seek originals in archive, which in turn embeds another type of difficulties;
- Difficulties associated with locating primary sources in archives pertain to archives' location that forces historians to travel in order to access sources. Also, the routine of archives causes difficulties such as short opening time. Another difficulty is related to the availability of original sources where they might be in use or excluded from the physical use due to being fragile;
- Missing the context of primary sources when working with digitised sources because accessing digitised sources means that historians access individual records that are separated from others in the same file or collection.

It seems clear that, the current model shows many mutual features with the models of Ellis (1989), and Meho and Tibbo (2003), which is not surprising because historians are part of the social scientists that the above models were proposed for. The same issue is noticed regarding the ISB of historians (Duff and Johnson, 2002; Rhee, 2012). Activities added by Rhee to the model of ISB of historians are supported in this model, yet not in all stages.

A need to be creative

Historians believe that creativity means originality in terms of coming up with an original idea, novel interpretation of historical events, or new combination of concepts. In psychology, it is agreed that creativity can be defined as the production that is both novel and valuable (Weisberg, 1993; De Bono, 1992, Gilhooly, 1996; Sternberg, 2006; Boden, 1990). Historians in their view meet the first part of this definition, which is novelty or originality. Nevertheless it is applicable to say that not every original idea is valuable, in historical research, exploring new ideas or interpreting historical events in a new way can be considered useful in the way that this would enhance our understanding of the history, which is valuable not only to the field of history, but to the whole humanity.

A few historians were unable to express their view about creativity or talk about their strategies of being creative when doing research. This seems very normal because part of creativity is considered to be vague and mysterious (Guilford, 1975; Boden, 1994; Martindale, 1999) and usually creative people fail in expressing how their novel ideas occurred. Bearing in mind that everyone can be creative in some ways (Boden, 1990; De Bono, 1992; Weisberg, 1993; Davis, 1999), the ISB of scholar historians is believed to come up with original ideas. In this context, historians need to be creative in doing research for which they stimulate their creativity through different ways:

Redirecting research:

Redirecting a research denotes the adjustments that historians make to their search direction either by narrowing down the research area, or combining two different areas or ideas. Usually research starts with a board context; however, historians find themselves in necessity to adjust their direction to fit research context and purpose. Sometimes this adjustment is caused by time limitation or encountered difficulties, while in other cases it could be a way of reacting to new discoveries.

Narrowing down a research helps historians to focus their thinking and searching on one area or problem in their field, which results in a novel idea or new discovery especially that focus is a very essential part of creativity (De Bono, 1992). This strategy of narrowing down a research is associated with the forward incrementation type of creativity (Sternberg et al, 2002) and exploratory creativity (Boden, 1990).

Constructing a relationship between two different areas where it seems there is not any, or combining two different aspects of ideas is another way that is approached by historians to produce original ideas. Sternberg et al (2002) described this strategy as creativity that synthesises paradigms. Creativity that is based on combination or integration was also considered by Boden (1990) Michalko (2001), and Young (2003) either by combine unfamiliar concepts, or making unfamiliar combination of familiar ideas.

Serendipity is seen as a source of creative ideas. Encountering unsought sources that embed valuable information impacts the research direction in the way that historians react towards this discovery in a creative way. This type of creativity is called accidental creativity (Weisberg, 1993), in which chance or accidental discovery is considered as a prime factor in the creative incident (Boden, 1990; De Bono, 1992) such as the story of discovering the penicillin by Alexander Fleming.

Accessing a wide range of sources:

Historical research is different from other fields of research because it is a sources-oriented research. It is heavily constructed upon existed primary sources. Historians use a wide range of sources (primary, secondary, published, unpublished, visual or oral) to help them telling a new story about the past. Having an online access to a variety of historical sources, especially the primary ones, assists the creative thinking of historians. Indeed, "creative thinking begins with what we knew" (Weisberg, 1993: 241), it is grounded in the existing knowledge, but it goes beyond this knowledge in order to achieve novelty. Information is an essential source for creativity (Amabile, 1997; De Bono, 1992) and gathering information is a primary activity in all models of the creative process (Wallas, 1926; Stein, 1974; Amabile, 1983; Young, 2003; Mumford et al, 2012). Adding that, the level of knowledge hold by individuals determines the difference between creative and non-creative thinking (Lubart, 2001; Weisberg, 1999). Creative people or inventors usually have the tendency to search and find diverse sources of information (Shneiderman, 1999).

From this, historians concern the availability of digitised primary sources as a source of creative ideas, in which facilitating and increasing this availability is one of the historians' demands.

Thinking

Historians revealed three types of thinking (innovative, conceptual, critical) when constructing research questions or hypothesises, designing methodology, and analysing information. In the creative processes (Wallas, 1926; Stein, 1974; Amabile, 1983; Young, 2003), thinking comes after gathering information in order to deal with this information trying different possibilities or hypothesis to come up with a solution or new idea. These different types of thinking that historians adopt inform their strategy of creatively doing research, which are reflected by their paradigm or conceptual space.

Clearly each type of thinking is shown to be associated with a certain type of creativity. Innovative thinking, dedicated to generate new ideas or approach a topic in a new way, supports the exploratory creativity (Boden, 1990) and the advance forward incrementation type of creativity (Sternberg et al, 2002). Conceptual thinking that denotes constructing new relationships supports the synthesising paradigm of creativity (Sternberg et al, 2002) that combines or integrates ideas (Boden, 1990; Michalko, 2001). Meanwhile, critical thinking that is based on analysing and arguing information is associated with the reconstruction/redirection type of creativity (Sternberg et al, 2002) and the transforming creativity (Boden, 1990) by rejecting the existing paradigm in order to change it.

Michalko (2001) suggested the fluent thinking and flexibility as one of the strategies to produce creative ideas; however, Sternberg, et al (1997) argued that creative thinking by itself is not enough for creativity; it should be collaborated with existing knowledge, intellectual abilities, personality traits, motivation and environment. Apparently, thinking, as a cognitive ability, entails the process of manipulating the gathered information, and in this context creativity is embedded in the way of working with information as no one did before.

Interaction

Historians consider talking with others as a way of stimulating their thinking and inspiring them further. They consider interaction with others, either formally (conferences) or

informally (talking with colleagues), as a source of information. Interaction enables individuals to access sources of information imbedded in relationships, accordingly individuals attempt to build and develop their relationships with others to exchange information and tacit knowledge for the sake of knowledge creation (McFadyen and Cannella, 2004). Interaction is considered as one of the stimuli that promote creativity (Purser and Montuori, 1999; Murray, 2006; Fisher et al, 2009; Sidawi, 2012; Sailer, 2011).

Whilst some historians express a difficulty in finding other historians who have similar interest to interact with, others stress the importance of interaction with researchers from other disciplines in stimulating creativity. Many studies proved the role of interaction through multi disciplines in stimulating creativity (Leonard and Swap, 1999; Paulus et al, 1999; Perry-Smith and Shalley, 2003; Perry-smith, 2006; Taylor and Greve, 2006; Amabile, 1998; Sosa, 2007; Amabile and Khaire, 2008; Baer, 2010) in organisations or team work; however, Yong (2012) argued that interaction in the same discipline yields greater creativity. Taylor and Greve (2006) stated that individuals have a greater ability in combining knowledge from different disciplines than a team. As interaction stimulates creativity in earlier stages of the creative process, communicating the results, in the final stage, with experts in the field is important to judge the creative product. Communicating and sharing the results helps developing them by considering critiques and feedbacks. This is what historians call formal interaction.

Inspiration

According to this study, works of others inspire historians in the way of sparking new ideas, or encouraging them to do further research either by imitating in some aspects, or by doing a different thing and arguing the findings of others. Borrowing a methodology from a different field of query can help being distinctive where the task of creativity is about being relevant in some way, but distinctive. Amabile and Khaire (2008) claimed the role of others such (leader or manager) in stimulating the creativity of employees. People can be cognitively stimulated by the exposure to the creative ideas of others (Fink et al, 2012). Zakeri (n.d.) confirmed that creativity of architectural students was inspired by the works of other architects. This leads

the talk back to facilitating the availability of sources and others' works to serve historians in their research and stimulate their creativity in which the role of IRS is considered to be fundamental.

Seemingly, creativity is a need for historians as it is in every field. Creative thinking helps breaking the traditional structure of information, and enables the full use of it to generate new concepts (De Bono, 1992). Historians in their ISB attempt to discover new facts about the past, new concepts and interpret history in a novel way. Here appears the role of IRS of digitised primary sources to support and stimulate this creativity as next section explains.

Enhancements for IRS of digitised primary sources

These enhancements are derived from the limitations and difficulties faced by historians when seeking information along with their strategies in stimulating creativity in an attempt to enhance the IRS of digitised primary sources in the way that supports the creativity of historians. Stimulating creativity through IS, computer interfaces, software design was a concern for a range of studies (Bawden, 1986; Couger, 1990; Treffinger, 1993; Shneiderman, 1999, 2000, 2002; Ford, 1999; Greene, 2002; Lee et al, 2005, 2007; Eaglestone et al, 2007; Makri and Warwick, 2010; Chang et al, 2011), especially that incorporating IT with creativity is essential to any field of human knowledge (Mitchell et al, 2003). Accordingly, the IRS of digitised sources is entitled for several enhancements in terms of: searching facilities, metadata, digitised sources, system, interaction tools, profile, training, and professional assistance. Each of these areas is explained in details showing the potential of IRS in stimulating creativity.

Searching facilities

Searching for and accessing primary sources at a fingertip is the main reason that drives historians to seek digitised primary sources. Searching for information varies in level between browsing (general search), and advanced search. Using any of these types depends on whether the information need or task is well known or not. Searching for certain names can be done precisely using advanced search rather than browsing that may come up with thousands of results but none is relevant. Browsing is more helpful in exploring topics,

especially in the opening stage of doing a research when the information need or task is ill defined (Marchionini, 1995, Large et al, 1999). In the literature of information science, browsing means navigation, scanning, observation, or monitoring, and it is associated with finding information in catalogue and bookshelves (Marchionini, 1995). In turn, defining needs and consequently formulating a search query are essential to retrieve the information that "best match" (Belkin et al, 1982a) these needs. However, the "best match" principle of IRS does not always meet its objective because users do not know the type of vocabulary used to describe sources, or the way that IRS functions as (Belkin, 2000). Indeed, being unable to define needs and unfamiliar with the indexing vocabularies used in retrieval systems are what cause the search process to end up with thousands of irrelevant results or none at all. Because analytical search strategy assumes the user's ability of defining his/her information needs in a search term (Large et al, 1999).

Facilitating a multi-layer search in the IRS of digitised sources entails flexibility in performing different types of search such as browsing, advanced search, and synthesising search. Integrating browsing and advanced search in one system is helpful to meet the information needs of historians that are either ill-defined or generally structured (Large et al, 1999; Marchionini, 1995). Similarly, Shneiderman (2007) called for creativity-support tools that are designed with multi-level functionality. Furthermore, it is helpful to consider the nature of historical sources in defining search term or query regarding subject, author, gender, time, geographical location, type and format of source. For example, being able to search for digitised letters written by British female nurses working at the front during the First World War in Serbia.

Advanced search helps focusing on a specific term or issue to explore more. This indicates its relationship with the exploration type of creativity, adding that focus is very important to creativity (De Bono, 1992). Supporting the exploratory search by finding more relevant information assists serious discovery (Shneiderman, 2007). Similarly, Greene (2002) mentioned free-pain exploration as one feature of creativity-support tools. As not all the encountered information was specifically sought (Case, 2002), historians acknowledge the

role of serendipity in finding valuable information and stimulating creativity. For this, they want the IRS to support the serendipitous discoveries that occur when browsing. They want the retrieved information to exceed the search query allowing the research to stray a little in order to discover unsought information. Likewise, the study of Delgadillo and Lynch (1999) reported the historians' trend in relying on serendipity while browsing. Indeed, browsing is considered as a source for serendipitous discoveries (Large et al, 1999; Morse, 1970).

Boden (1990: 234) defined serendipity as "finding something valuable without its being specifically sought", Sternberg et al (2002) stated that part of creativity is accidental, Boden (1990) and De Bone (1992) considered chance as a source for creativity, which emphasised the importance of serendipitous retrieval of information in stimulating creativity (Toms, 2000). Even though serendipity was not included in the ISB, it was shown as an important aspect in finding information and generating new ideas (Foster and Ford, 2003). As part of the historians' methodology depends on serendipity, there is a need to support this serendipity when searching for digitised primary sources.

Searching for the purpose of synthesising or constructing relationships between different areas pertains to the combination type of creativity where historians attempt to integrate different aspects or ideas. Since combining unrelated ideas in a novel way is creativity (Boden, 1990; Michalko, 2001; Sternberg et al, 2002; Young, 2003), presenting interdisciplinary information that connects unrelated subjects helps thinking outside the boundaries of a field (Bawden, 1986). Retrieving relevant (similar keywords) yet divergent (from different field) information supports the creative thinking (Ford, 1999). For those who believe in synthesising paradigm and integrating different concepts of ideas, it is helpful for them to present the indirect relationships between different areas of literature when retrieving information. This idea was well presented by a study of Swanson et al (2006) conducted to improve Arrowsmith (a computer-assisted process for literature based discovery) that is "used to search for, organise, and display information for users, who then look for implicit connections that may suggest novel, plausible scientific hypotheses".

Visualising the relationships between sources is another way to support historians in their research by enabling backward (citation) and forward chaining (recommending relevant materials). Mapping this kind of relationships supports historians in knowing who and how a source was used, which lead historians to some relevant topics or sources that were unknown. Following citations could direct historians to new sights or ideas (Rhee, 2012). Backwards and forwards chaining are fundamental activities that Ellis (1989) featured in designing IRS, while Duff and Johnson (2002) and Rhee (2012) highlighted only the importance of backward chaining in historical research.

Normally, searching text is not an issue in IRSs, yet it is when searching digitised primary sources because digitising or scanning sources produces digital images with unsearchable text. Clearly, this feature supports the productivity of historians where they do not have to read the whole record to see if it is relevant or not, or when doing a content analysis.

Metadata

Metadata of primary sources is not sufficient, and clearly historians need more information about primary sources when searching virtually. This need is inherited from the nature of historical sources in which historians are interested not only in the contents and circumstances of creation, but also in the physical features of sources. For that reason, providing descriptive and analytical information about primary sources is stimulating and compensating, to some extent, the physical access. Metadata, especially the descriptive type, is "structured information about information sources of any media type or format" that serves the purposes of discovery, identification, selection, evaluation, linkage and usability (Caplan, 2003:3-4). Metadata varies according to the information source formats to which describing primary sources entails further emphasis on creation circumstances unlike the secondary sources (Foulonneau and Riley, 2008). Similarly, metadata of original primary sources is different from the one that is created for digitised primary sources that requires more focus on physical features and context.

For historians, metadata is a secondary source of information. It provides historians with the contextual knowledge required for research, facilitates sources' identification, reduces uncertainty, and supports their decision about relevant sources. Historians emphasise some issues about catalogues and abstracts in terms of usage difficulty, accuracy, and availability. Indexing is concerned in the way that impacts information retrieval, while statistics emerged from the historians need to sometimes assess the usability of certain sources such as following rarely used sources when seeking new discoveries.

Cataloguing and indexing

Historians report some difficulties when using catalogues regarding accuracy, comprehensiveness, and usage. Catalogues are the entry to the contents of archives, which entails the necessity to be accurate, easy to use, and reflective. Historians initiate their research by browsing catalogues to orient themselves with topic, archival collection, and also to locate sources likewise previous studies (Delgadillo and Lynch, 1999; Tibbo, 2003a; Anderson, 2004). Noticeably, in the study of Duff and Johnson (2002) and the theoretical analysis research of Rhee (2012) the word catalogue was not mentioned in the historical research; rather finding aids was used plenty of times. Finding aids is a kind or archival description of collection as a whole (Caplan, 2003; Tibbo, 1994), while catalogue presents descriptive entries for records or sources individually. Jimerson (2002) argued for collective description of archival material to clarify the creation context; however, integrating finding aids and catalogue showed fruitful results in increasing the awareness of archival materials (Brown and Harvey, 2007), especially that the popularity of online/printed finding aids (Duff et al, 2002; Tibbo, 2003a; Dalton and Charnigo, 2004; Anderson, 2004, Duff et al, 2004 a b) exceeded archival catalogues.

Tibbo (1994) argued that the problematic issue in archival catalogues pertains to indexing terms, and further she elaborated that indexing primary sources is challenging because they are written in multiple levels and a word may have multiple meanings in which indexer has to understand the complexity of them for accurate descriptions. Case (1991a) stated that history is the less served field in terms of indexing and classification. Indexing terms acts as an access

point to information and there should be a balance between exhaustivity and specificity of selected terms in order not to overweight the comprehensivity of recalls over precision.

Historians mention the subjectivity of index terms and what seems a correct term for archivist may does not for historians. Even though indexer considers the content of sources as well as the target users, they are still subjective and often there is no consensus on a set of terms (Lancaster, 1998) for which historians suggest themselves to help in selecting terms either formally (professional assistance) or informally (interaction with historians). Foulonneau and Riley (2008) mentioned the potential role of web 2.0 applications in creating metadata and identifying the actual words that users use. Meanwhile, Caplan (2003) suggested enabling users to access index list or thesaurus used in IRS, thus they can structure their search terms in the light of the actual vocabularies used in indexing.

In both theory and practice, indexing terms are often derived from abstract with association of other parts of a source (Lancaster, 1998). Considering that indexing and abstracting are very much related activities; it is surprising how archivists care about indexing more than abstracts because in this study historians reported a frequent absence of abstracts. Similarly, historians in the study of Dalton and Charnigo (2004) appeared unsatisfied with abstracts and indexes.

Abstracts

Abstracts are greatly helpful, in representing the essential contents of sources, and facilitating information retrieval by identifying relevant terms. A good abstract enables historians to assess the relevance of sources or records without the need to read the whole content. Absence of abstracts is the case for many primary sources, which entails historians more efforts reading and browsing through the whole contents. In turn, dull abstract can be helpless and cause frustration. Accuracy is an important aspect of abstracts (Lancaster, 1998) unless they would be misleading. Historians concerned accuracy, coverage and affiliate

organisation in assessing the quality of indexes and abstracts (Dalton and Charnigo, 2004). Tibbo (1993) also reported inadequate contents of abstracts.

Reading the whole content is a time consuming task, especially if word search is not facilitated for digitised sources, or primary sources are not digitised yet. Producing online abstracts is essential also for non-digitised primary sources to support the productivity of historians because abstracts act as a surrogate, and avoid historians the burden of travelling to archives when sources are not relevant.

Abstracts of primary sources should provide different types of information that enables historians to gain an initial comprehensive knowledge about sources. This comprehensive view can be achieved by considering:

- Analytical information that can be presented by answering the 5Ws and H questions: what is a record about? Why the record was created (purpose)? Who created the record and who are involved (names of individuals, parties, groups, organisations... etc.)? When the record was created? Along with indicating any dates and names involved in the event. Where did the key event happen?
- Physical description and conditions such as paper, ink, colour, suitability for physical access, annotations ... etc. ;
- Language, text type and a small sample of the text;
- Key words derived from the analytical information;
- Format that record available in (original, microfiche, microfilm, digitised);
- Context and order such as referring to the collection that a record belongs to and the name of archive existed in;
- Link to digital format if available.

Constricting abstracts this way serves both original and digitised primary sources and gives historians the information that is required to assess relevance, and facilitate access as availability shows. It also assists indexers in selecting terms that reflect the content of records. Tibbo (1993) proposed a set of information to be considered when abstracting historical literature such as: historical period and dates of key events, names of key

individuals, groups, organisations and events. Recommendations of Tibbo's study concern secondary sources of history, whereas the above structure of abstract focuses on primary sources.

Sources statistics is another type of metadata that gives information about sources' usability such as the most used sources or collection. This contributes to the knowledge of historians about the popularity of certain sources or collection and the way they were approached by others. This inspires historians to deal with these sources either in consistency or in a different way. However, other historians may use these statistics in a very different way by avoiding the popular sources and seeking the least used sources as a strategy of being creative.

Digitised sources

Increasing the range of digitised primary sources stimulates the creativity of historians; mainly because information is essential sources of creativity, adding that one of the reasons to seek original sources is that originals are the only option. The lead role of traditional materials is clear in historical research (Delgadillo and Lynch, 1999; Dalton and Charnigo, 2004; Duff et al, 2004 a, b; Anderson, 2009) because online and digitised sources are not well established in the historical context, adding that availability and awareness about such sources are limited. Historians were not satisfied with the scope of electronic sources (Dalton and Charnigo, 2004) although they found them useful. Noticing that many historians made a habit of taking photos of original sources in archives to save them electronically; indicates their demand to more digitised sources. Recognising the potential role of digitisation and changing the seeking behaviour of historians entail archives more efforts to be up-to-date with the information needs of historians.

Apart from the limitations mentioned previously; historians also miss the context of primary sources when accessing them electronically. The context of primary sources is essential to historians to understand their creation circumstances (Duff and Johnson, 2002; Rhee, 2012)

in order to properly interpret the past events. Accessing primary sources in their digitised format prevents historians from this contextual knowledge because historians retrieve individual records that are unconnected with others from the same collection. Linking records or sources from the same collection together in a sequential method would be helpful in presenting the actual order of records. Furthermore, linking digitised sources to online finding aids that provide collective description of archival materials is beneficial to visualise the context of digitised primary sources. Apparently, maintaining a continuous supply of digitised sources and presenting their context virtually supports the real meaning of *Digital Archives* in reflecting the real context of archival materials, which in turn increases the productivity of historians and stimulates their creativity.

System

One of the difficulties that historians encountered is unfriendly system in which IRS was difficult to use and navigate thorough especially when using computers with old version of system. Generally, easy-to-use or friendly user system is one of the factors that measure system quality and indicate its success (Rivard et al, 1997; DeLone and McLean, 2003; Sedra and Gable, 2004; Gorla et al, 2010). Similarly, Andersen (1998) reported that easy navigation of historical web pages is a critical success factor, and further she mentioned that using new IT requires up-to-date equipment and software that are not always available for historians. Therefore, system flexibility is seen as another factor that impacts the success of IS (Sedra and Gable, 2004; Nelson et al, 2005). The concern of information professional is coming up with the best system without consulting users (Nicholas, 2000), they seems like designing ISs for users who have high-level skills in searching and using internet. Developing technology in such a rapid manner creates gap between those who use these new applications and the others who are not familiar with these application (Treffinger, 1993) and designers should consider that users do not share the same level of skills for which Shneiderman (2007) called for multi-layer design that can be used by novices and experts each according to their skills.

Training

Due to the difficulties faced by historians in using catalogues, searching and navigating through IRS; some kind of training is important to develop their search skills. It could be true

that young historians had the chance to be educated using IT; teaching them how to search, construct search term, using catalogues and finding aids can be stimulating and helpful to promote their research productivity. Users of IRS need to know about metadata and how it works in order to effectively retrieve information (Haynes, 2004). Knowing about indexing and how terms were selected can enhance historians' ability in expressing their information needs in search queries; especially that "best match" retrieval of information requires the match between search term and index terms (Belkin et al, 1982; Large et al, 1999). Providing instructions or five minutes video on how to use and navigate through an IRS is also useful. Urbach and Müller (2012) considered IS training as one dimensions that measure service quality. Andersen (1998) reported the historians' need for training on using new technologies, while Orbach (1991) recommended training historians about historical research method and finding information, along with training archivists as well. The role of archivist, as librarians, is required to change into educator or trainer (Poyner, 2005), especially after using IT in archives.

Interaction tools

Even though doing research is an individual task, historians indicate the role of formal and informal interaction in stimulating their creativity. Historians report that finding other historians with the same interest to interact with is not easy. In turn, they appreciate the role of interaction with others from different disciplines in stimulating their creativity. This type of interaction with others from different backgrounds pertains to creativity that combines different areas or ideas. Historians in a study of Case (1991a) mentioned the key role of colleagues in formulating their research question. Similarly, Bawden (1986) stated that providing formal and informal communication channels supports speculative type of information. Shneiderman (1999) proposed that communicating, consulting and discussing ideas with others who have the same interest stimulate creativity and thus these functions should be supported by computer interface design. The proposed functionalities for designing creative electronic information sources in the study of Makri and Warwick (2010) were highly influenced by the features of Web 2.0. For this, IRS of archives is considered to support the interaction of historians especially that ITs are rapidly moving towards supporting the communication and interaction side of information.

Integrating Web 2.0 application with IRS of digitised sources can be promising in structuring metadata (Foulonneau and Riley, 2008). Yakel et al (2007) introduced the next generation of finding aids by integrated social navigation features in archival access system by the means of commenting, collaborative filtering, bookmarking, and visitor awareness to enable historians' voices. This supports the transition of users' behaviour from passive to being more involved in the process of information retrieval (Poyner, 2005). Theimer (2010) introduced several Web 2.0 tools and provided a guide for successful implementations in archives. Being able to comment on sources and reading what others wrote could lead to new discoveries or stimulate the thinking in a different direction.

Profile

Allowing historians to create profiles or accounts in IRS of archives helps historians interact with others who share the same interest, adding that this profile could act as a personalised database (appendix 9). It happens that historian cannot find a source that he/she downloaded before, or cannot locate or remember what he/she wrote when first read a certain source. It may occur to find an interesting note that a historian wrote, but he/she cannot link this note back to a particular source or record. Many of these situations could have been avoided if historian has a profile that keeps together sources, notes, and ideas in one save place. Keeping history of research can be quite helpful to save historians time and avoid re-looking for sources. Shneiderman (2007) considered keeping history as one of the creativity-support tools in designing computer interface, which enables users to look at what options had been tried before. Incorporating Web 2.0 applications with personal profile in IRS of digitised sources or what one historian called "Facebook of History" could have some proposed benefits in supporting the interaction between historians and keeping relevant sources in a place that one cannot lose. Many features can be applied to this profile such as; tagging to inform other about something might be interesting to them to seek others' opinions. Commenting is another feature to enable interaction between historians about sources, especially when notifying others about new comments. Leaving a note for further work could be more useful if it was linked directly to a particular source. Some historians may be cautious about their ideas or notes, thus customising security setting seem essential to control what

appears to the public. Makri and Warwick (2010) proposed the use of tagging, bookmarking, commenting, uploading images and videos to the functionalities of IS for architects. Many historians have the tendency to create their own digital archive by photographing primary sources and saving them electronically; however, allowing them to upload some of these digital photos into the IRS may be authentically very restricted.

Professional assistance

In many cases, historians mention the subjectivity of information provided by archivists about primary sources such as in abstracts or indexes terms, which affect the accuracy of retrieved information or documents. This may due also to the complexity of historical sources (Tibbo, 1994). Subjectivity is something that will always occur and archivists need to ensure the consistency of provided metadata (Lancaster, 1998) by enabling historians to participate in processing archival sources, especially metadata. Archivists are professional in terms of collecting, preserving, managing and handling out archives materials; however, processing primary sources from the perspectives of historians could be very difficult. What interest archivists may be different from what interest historians. For this reason, getting professional helps from historians in the processes of indexing and abstracting can enhance the consistency between what archivists do and the information needs of historians. This assistance can be acquired either formally from professional historians directly, or informally by enabling the indirect interaction between archivists or IS and historians through Web 2.0 application (Foulonneau and Riley, 2008; Yakel et al, 2007).

Another type of professional assistance can be offered to historians especially the ones who are not very experienced in dealing with sources that are in old English or other foreign languages. Students are seen to face this problem more than others where they seek a professional help in order to be able to understand their sources. It could be possible to provide a translated copy beside the original source or providing this service on demand with discounts for students.

These enhancements are proposed to overcome the limitations of IRS of digitised sources by the corporation of things learnt from ISB of historians and their strategies of stimulating creativity to potentially increase historians' productivity and support their creativity.

According to the areas that has been involved in the above discussion, a successful IRS is not only about how effectively it retrieves documents or sources that match historians' queries; there are further issues that concern historians such as accurate and rich metadata, friendly system, interacting tools, and more sources. Enhancing IRS in the way that visualises its ideal components as derived from the experiences of historians; would be more comprehensive if reflected on the IS success model of DeLone and McLean (2003):

- System quality: historians want the IRS that is flexible and easy to use. In the literature, easy to use system is commonly stated as a measuring factor of system quality (Davis et al, 1989; Rivard et al, 1997; DeLone and McLean, 2003; Sedra and Gable, 2004), similarly as flexibility (Sedra and Gable, 2004; Nelson et al, 2005);

- Information quality: regarding metadata, historians need accurate and complete information. Nelson et al (2005) considered accuracy and completeness as measuring factors of information quality. However, regarding digitised sources, historians need more sources to be available online for which availability is on one of the success dimensions (Sedera and Gable, 2004);

- Service quality: historians need to be trained about doing research, using catalogues, and finding aids in order to retrieve information easily, which is part of measuring service quality (Urbach and Müller, 2012). Good communication channel is another success dimension of service quality (Watson et al, 1998) which should be highly considered by archivists to better understand the information needs of historians;

- Intention to use/use: ease of use and usefulness determined to a large extent the intention to use any IS again (Davis, 1986). Likewise, difficulties experienced by historians in using catalogues and retrieving information may impact their intention to reuse this system again. For example, finding inaccurate information causes historians to seek primary sources in archives;

- User satisfaction: historian would be satisfied if they have more digitised sources, accurate and complete metadata, friendly user and flexible system, and effective

searching facilities as these issues were identified to measure user satisfaction (Doll et all, 2004; Ong et al, 2009; Urbach and Müller, 2012);

- Net benefits: is measured on both historians and archives (DeLone and McLean, 2003). IRS of digitised sources appears to impact the productivity and creativity of historians by providing online access that saves their time, effort and money. In turn, this would impact the services of archives by increase the accessibility of their contents and reduce the pressure on original sources and archivists as well.

Showing consistencies with the success model of IS emphasises the importance of these proposed enhancements in answering the information needs of historians and potentially stimulating their creativity. This comprehensive framework is believed to assist archivists, librarians and information professionals who consider the information needs of historians to be in the top of their priority.

Summary

This chapter discussed the limitation of IRS of digitised primary sources derived from questionnaire and interview results. These limitations proposed the necessity to enhance this IS in the light of understanding the ISB of historians and their strategies of stimulating creativity. Eight different issues (searching facilities, metadata, digitised sources, system, training, interactive tools, profile, and professional assistance) were discussed as ways to enhance IRS in terms of drawing evidences from the literature to support these enhancements. These enhancements were also reflected on the success dimensions of DeLone and McLean's model (2003). Enhancing IRS in the ways that were proposed would potentially help historians stimulate their creativity and increase their productivity.

Conclusion

The findings of this thesis were discussed in the previous chapter; this chapter is dedicated to drawing conclusions about the aims and objectives of the thesis. Findings are presented and evaluated in response to the questions proposed at the beginning of this thesis.

The research agenda that emerged in this study came with the realisation that scholarly information seeking has recently confronted a number of new challenges. Researchers have always needed access to information but with the increasingly rapid pace of digitisation and other types of publishing there are now immense amounts of information to discover, obtain and evaluate. Researchers must use a variety of tools to do this some of which were designed for general information seeking. The research hypothesis that triggered this project is that an information-seeking system designed to meet the specific requirements of one research community should help to increase the effectiveness of that community's searches. To test this hypothesis the author created an original model of the ISB of academic historians which should be useful to developers of future IRS.

The principal aim of this thesis has been to assess the information needs of historians working with original primary sources in order to enhance the IRS of digitised primary sources. This thesis argued for the role of digitised primary sources in increasing the productivity and stimulating the creativity of historians, especially that online access has become a norm in the digital age. Considering the issue of having different types of questions; this study approached both quantitative and qualitative research in a sequential design. Initially, an online questionnaire was distributed to historians around the UK to mainly identify their preferred format (original, digitised) of primary sources, and the most useful format. Preliminary information learnt from this phase helped in defining the research problem to be further investigated through a grounded theory approach using semi-structured interviews to obtain a deep understanding of the ISB of historians, their strategies of stimulating creativity, and limitations of current IRSs of digitised sources. A theory of enhancing the IRS of digitised

sources proposed several strategies that would help in promoting this system to better meet the information needs of historians.

Findings of the study

In this context, the findings of the study are presented with the potential to answer the questions that were proposed earlier in the introduction:

Q1. What is the historians' preferred format of primary sources (original or digitised)? And which format is the most useful to historians?

Original primary sources were found to be the preferred format, yet digitised primary sources were said to be more useful than originals. This indicates that the positive attitude of historians towards digitised sources is increasing due to the advanced development of IT and its impact on the ISB of historians. Historians became aware that the online access of primary sources advantages would enable them overcoming the difficulties that were caused by geographical location and sources' conditions (see chapter 3).

Q2. What information needs, satisfied by original sources, cannot be met by digital formats? In other words, do historians need more information when searching virtually?

Indeed, historians needed more information when searching and using digitised primary sources in terms of metadata and contextual knowledge. Historians are not only *expert users of text* (Case, 1991b); they also make a good use of the contextual knowledge to re/structure the relationships between sources or events. Furthermore, historians pay more attention to the physical features and conditions of primary sources as a considerable source of information (see chapter 3). The results revealed that historians are not well served regarding catalogues and abstracts, besides missing the context of primary sources. The physical conditions and context of sources are typically available when accessing original primary sources, while they can be missed in the digitised format. This revealed the need for more description of original sources regarding physical conditions and any annotations or marks that appear sometimes on the back of the record. Similarly, maintaining the context of

digitised sources is essential by presenting one record in its original position among others in a collection, and linking this record to the finding aids that describe the whole collection.

Q3. In which way/s do historians stimulate their creativity during their research?

From a scholarly perspective, there is a need to be creative with regard to coming up with an idea that is original and useful to the field. For historians, originality means a new interpretation or telling a story in a new and different way. For this purpose, historians approach different strategies such as:

- Redirecting their research by narrowing down a query to concentrate on a specific area seeking new discoveries, or by combining or creating relationships between two different ideas where it seems there are none;
- Accessing a wide range of sources is essential to historians because information is a key source of creativity. Historians revealed that the availability of sources impacts their creativity, while others described their preference for working with sources that are rarely used for which they seek sources in remote and unknown archives;
- Interaction with others formally (conferences, seminars) or informally (colleagues) is also said to stimulate the creativity of historians. Interacting with scholars or colleagues from different discipline is shown to be stimulating especially that finding historians who share the same interest is always possible.
- Thinking styles of historians are related to their cognitive skills in dealing with or manipulating collected information. In this context, historians demonstrate three types of thinking: innovative, conceptual and critical. Innovative thinking is devoted to finding new discoveries, conceptual thinking is related to combining different ideas or creating new relationships, while critical thinking is seen as generating a new source of ideas by asking questions, arguing preconceptions, comparing, and working with controversial areas;
- Being inspired by others' works, perspectives, or talk stimulates the creativity of historians by either imitating them in some aspects or doing completely a different thing.

Regarding the context of the historical research, this study is the first in the literature to empirically investigate the stimulation of creativity. The significant of these findings clearly

emerges from their potential role in assisting the design of the IRS that meets the information needs of historians and stimulates their creativity.

Q4. What is missing in the current IRS of digitised primary sources? Or what features can be added to the IRS of digitised primary sources to better help with satisfying the information needs of historians and thus stimulating their creativity?

This study proposed several enhancements to the IRS of digitised sources based on the limitations identified by investigating the ISB of historians and recommendations made by historians themselves (see chapters 4 & 5). These enhancements were categorised in eight areas (table 13):

Proposed enhancement	Known	New	literature
Searching facilities		✓	
Metadata	✓		Tibbo (1993, 2003a); Anderson 2004
Digitised sources		✓	
System		✓	
Interacting tools	✓		Yakel et al(2007); Theimer, (2010)
Profile		✓	
Training	✓		Orbach (1991); Andersen (1998)
Professional assistance		✓	

Table 13: The proposed enhancements vs. literature.

Table (13) presents the proposed enhancements to the IRS of digitised primary sources in a way that shows which ones were identified in earlier literature and the ones that are

originally proposed by this study. Some aspects of metadata were concerned by a few studies, but did not receive the importance that they deserved. Tibbo (1993, 2003a) was interested in abstracting (1993) and finding aids (1993) likewise Anderson (2004) who called for more online finding aids. Using Web 2.0 applications in archives has been proposed by Theimer (2010) as a way of disseminating information about archival collections and events, while Yakel et al (2007) introduced the next generation of finding aids by the means of Web 2.0 tools. Offering some kind of training was briefly recommended to help historians in using new technologies and historical research methods (Orbach, 1991). Clearly developing the IRS of digitised primary sources was not well concerned by the information studies of historians or by the archivists and information professionals; as this study did.

Evaluating the results

The evaluation of the results is approached by four criteria that were defined by Charmaz (2006):

- *Credibility*: the findings of this study fit the investigated area because they were generated by a close investigation of the information needs and ISB of historians (the main participants) in which the proposed enhancements would improve their daily practice. The results also came to support the study's claim that digitised sources increase the productivity of historians and support their creativity where several pieces of evidence were provided from collected data and literature;

- *Originality* of the results comes from providing new insights about information needs of historians working with digitised sources, ways of stimulating creativity of historians and enhancing information retrieval system of digitised sources (more details are provided in the next section);

- *Resonance*: since the results are provided to enhance the IRS of digitised sources, they are presented in a way that is understandable by archivists, librarians, information professionals, as well as historians;

- *Usefulness*: of the results is embedded in the contribution to the knowledge by providing new insights about the information needs of historians. In the same way, the results are useful to archivists who aspire to improve their services and enhance IRS.

The contributions of the study

This study has contributed to the knowledge and field of information studies by providing new insights about the information needs of historians working with digitised primary sources especially that this issue did not receive a proper interest in the literature. The dominating role of original primary sources in historical research has been clearly stated (Delgadillo and Lynch, 1999; Duff et al, 2004 a, b; Dalton and Charnigo, 2004; Andersen, 2009) and historians found them the most useful format (Duff et al, 2004 a, b). This study revealed a considerable change in the ISB of historians; mainly by considering digitised primary sources more useful than originals (see chapter 3). Further, this study found that digitised sources are not doing as much as they could and should to increase the speed of transfer of historians' preference to move towards the digitised sources. Historians will never give up preferring original sources; however, the issue is that for how long original sources are going to be accessible. What is needed to be done is to improve the digitised sources in order for historians to prefer them as originals.

Another key contribution to be mentioned is the ISB model of historians in which it differentiated between seeking behaviour of original sources and digitised sources, and highlighted the encountered difficulties (see chapters 4/part 1 and 5). This model consists of five stages (identifying needs, following information, accessing, judging relevance and absorbing/using information) and each stage involves a set of activities (see page 220). The usefulness of this model is embedded in providing a real picture of how historians search for primary sources in both formats (original and digitised), which informs the design of IRS of digitised primary sources. Furthermore, showing a variety of activities that historians perform or wish to perfume along with the difficulties and limitations of the current IRS, helps in improving this system in the way that meets the information needs of historians regardless of their expertise level.

Again, this study provided fresh perspectives about creativity in the context of historical research where non in the literature did. To stimulate creativity, historians tended to change their research direction, access a wide range of sources, approach different types of thinking,

interacting with others, and being inspired by others' works (see chapter 4/part 2) Defining different ways of stimulating creativity of historians when doing research reinforced the proposed enhancements to the IRS of digitised primary sources.

Finally and most importantly, this study proposed a set of enhancements to the IRS of digitised sources; indicating the ideal components that historians looking for. These enhancements involved eight areas (searching facilities, metadata, digitised sources, system, training, interacting tools, profile, professional assistance) that collaborate together for the purposes of satisfying the information needs of historians, increasing their productivity and stimulating their creativity. The success of IRS is not reflected only by retrieving the required documents, rather there are several featured entitled to be available in this system such as a friendly-user system, sufficient metadata, wide availability of sources etc... (see IS success in chapter 1). Integrating the information learnt from the information needs of historians, ISB as well as their strategies of stimulating creativity, helped in capturing the whole view of how historians do research. This comprehensive framework for enhancing IRS is believed to assist the work of archivists, librarians, and/or information professionals for which it is produced in a clear and understandable structure.

Limitations of the study

One limitation of the study is related to methodological issues; namely regarding the sample design. A considerable effort was made to ensure quality and diversity of population that was surveyed, though results of the survey might be criticised for its generalisability. Sampling for the online questionnaire, approached in the first quantitative phase, was not designed by the means of probability techniques; rather it was based on the convenient approach. The reason for this was that results were needed quickly, and probability sampling requires more preparation and consumes time. Another reason for avoiding the probability sampling was that the questionnaire was used to obtain preliminary information that was further investigated in a second qualitative phase.

In the same way, modelling the ISB of historians came in an opening stage of a grounded theory investigation to mainly identify the limitations of difficulties faced by historians when seeking digitised and/or original primary sources. Activities approached by historians were supported by the literature nevertheless a broad investigation is required to support the generalisability of this model. For example, would there be different sub-task behaviours performed by historians?

Further research

The intention of this study was to produce a comprehensive framework for enhancing IRS of digitised primary sources in which issues related to system or interface design were out of the study scope. More work is needed regarding the proposed application HistoryBook (appendix 7) to be further enhanced, presented in Unified Modelling Language (UML) (Eriksson et al, 2004), and subsequently designed. The importance of this application comes from being derived from the information needs of historians along with the recommendations that they made. Presenting different aspect of this application using models and diagrams (use-case, class, object, activity...etc.) provides by the end a view of the complete picture that would essentially guide and assist the design of HistoryBook. We would expect future users of this type of search tool to refine their ISB as they become more familiar with the tools. This will lead to an iterative approach in which we will review the model of ISB as it changes through exposure to technology and then use the refined model to suggest further changes to that technology. This type of research has the characteristic of a virtuous circle in which favourable engagement with the retrieval system gives rise to richer models of ISB which subsequently suggest further improvements to the software.

Appendix 1: Digitisation cost

Table (1) presents the overall cost of some digitisation projects plus time and the total digitised materials. Also, when planning for a digitisation project it is beneficial consider the cost of different activities not only the scanning work as illustrated in figure (1).

Project Name	Digitised materials	Cost	Time	Funder
19th century pamphlets online (1)	26.000 Pamphlet	[£87,000] estimated	1/03/2007-28/02/2009	JISC and Research libraries UK
UK Thesis Digitisation Project (2)	20,000 Thesis	£451,350	1/04/2007-31/01/2009	JISC
Wellcome Arabic Manuscript Cataloguing Partnership (3)	500 manuscript	£ 137,269	1/09/2009-28/02/2011	JISC and Wellcome Library
Digital Islam theses on ETHOS (4)	860 theses	£76,400	1/01/2009-30/11/2009	JISC

Museum of Design in Plastics Digitisation Project (5)	1500+ objects	£156,645	01/10/2008- 30/09 /2009	JISC and The Museum of Design in Plastics.

Table 1: Digitisation projects cost
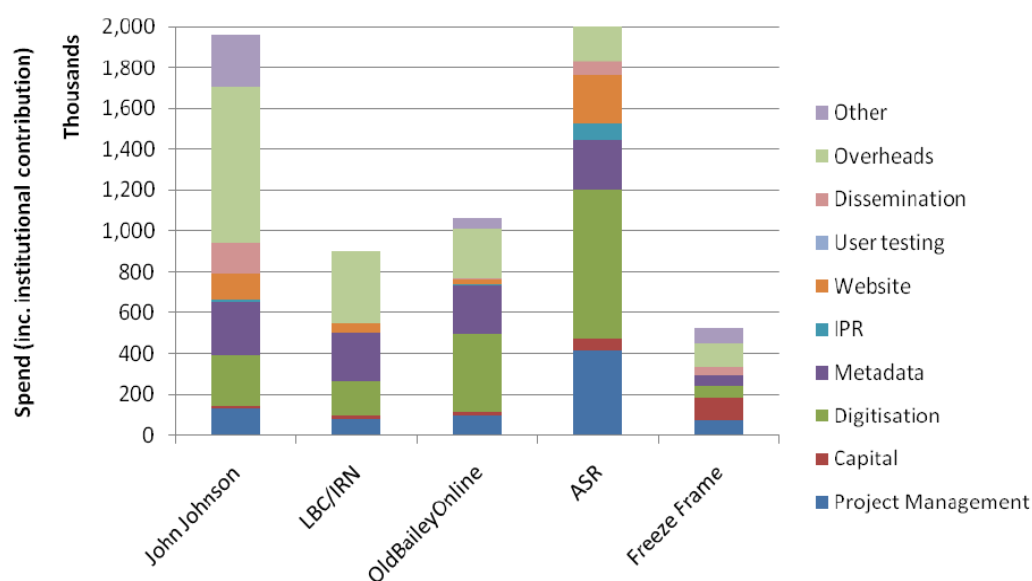
Figure 1: The cost of digitisation regarding different stages of the project (6)

Reference

1. Young, G. (2009) 19th Century pamphlets online: final report. *JIS development programmes.* Available at :< http://www.jisc.ac.uk/media/sources/programmes/digitisation/pamphletsfinal.pdf > (accessed 15/06/2013)
2. Troman, A. (2007) UK Thesis Digitisation Project: Project plan. Available at :< http://www.jisc.ac.uk/media/sources/programmes/digitisation/ukthesespp.pdf> (accessed 15/06/2013)
3. Henshaw, C. (2009) Wellcome Arabic Manuscript Cataloguing Partnership: Project plan. Available at :<

http://www.jisc.ac.uk/media/sources/programmes/digitisation/wamcp_projectplan.pdf> (accessed 15/06/2013)

4. Troman, A. (2009) Digital Islam theses on ETHOS: project plan. Available at :< http://www.jisc.ac.uk/media/sources/programmes/digitisation/thesisdigi_proposal.pdf> (accessed 15/06/2013)

5. Lambert, S. (2009) Museum of Design in Plastics Digitsation Project: final report. Available at :< http://www.jisc.ac.uk/media/documents/programmes/digitisation/modipfinalrep1.pdf> (accessed 15/06/2013)

6. Hammond, M. and Davies, C., (2009) Understanding the cost of digitisation: detail report. Curtis Cartwright Consulting Ltd. Available at :< http://www.jisc.ac.uk/media/sources/programmes/digitisation/digitisation-costs-full.pdf> (accessed 15/06/2013)

Appendix 2: Questionnaire form

Assessing the information needs of historians working with digitised sources in the UK

This questionnaire was designed by a PhD student at the Department of Informatics in the School of Computing and Engineering, University of Huddersfield, for the purpose of investigating the information needs of professional historians; mainly exploring their preference between working with digitised or original primary sources. This is to help in the design of an "ideal" information retrieval system of digitised historical sources.

Data collected from this questionnaire will be treated in the accordance with the Data Protection Act and used only for the above purpose.

Your participation to complete this survey is highly appreciated. Further, it is significantly valuable to my research which is a humble step toward improving historical retrieval systems.

As I believe that your time is very value, I promise that this survey would take less than 10 minutes.

If you have further questions or want to add any comments, please contact me on:

E-mail: l.hassan@hud.ac.uk

 Many thanks in advance.

1. In which period of time does your main research interest rest?

    ----

2. How long have you been working in this area? (Please tick as appropriate)

    -Less than 1 year ☐

    -1-5 years ☐

    -6-10 years ☐

    -More than 10 years ☐

3. Which format of sources do you use in your research? (Please tick as appropriate)

    - Original primary sources ☐   if yes please go to question (4)

    - Digitised primary sources ☐   if yes please go to question (5)

    Other---

4. Which type of primary sources do you use most in its original format?
    (Please tick as appropriate, and then go to question 6)
    -Letters ☐

    -Manuscripts ☐

    -Diaries ☐

    -Maps ☐

    ☐   252

-Photos

-Paintings [ ]

Others--

Why do you use this type of primary source in its original state most?

----

5. Which type of digitised primary source do you use most?
   (Please tick as appropriate, and then go to question 6)
   -Letters [ ]

   -Manuscripts [ ]

   -Diaries [ ]

   -Maps [ ]

   -Photos [ ]

   -Paintings [ ]

   -Others---

   Why do you use this type of primary source in its digitised format most?
   ----

6. How do you normally locate your primary sources?

	Most used	Often used	Infrequently used
Printed catalogues & bibliographies			
Footnotes			

Informal way (e.g. colleagues)			
Visiting archives			
Online search tools (online catalogue & bibliography)			
Serendipitously (by Chance)			

7. Which format of primary sources do you prefer to use?

    -Original   ☐

    -Digitised   ☐

   Why do you prefer using this format? Please give an example(s)

   ----

8. Which format of primary sources do you find most useful?

    -Original   ☐

    -Digitised   ☐

   Why do you find this format most useful? Please give an example(s)

   ----

9. Do you experience any of the following problems when searching for, and using, original primary sources?

	Most problematic	Problematic	Least problematic
Access to sources is limited by geographic location			
Access is unavailable due to sources' conditions (fragile)			
Difficulty in locating and finding original sources			

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Limited access due to privacy and security legislation			
Permission is required from donor			

10. Have you ever had cause to question the authenticity of digitised primary sources?

    (Please tick as appropriate)

    -Yes ☐

    - No ☐

    If yes, in which situation have you been caused to question the authenticity of digitised sources?

11. Do you concern yourself with the physical features of the original primary source (type of paper, materials, colour, ink, size, conditions of sources…etc.)?

    -Yes ☐

    -No ☐

    If yes, in which situation(s) do you concern yourself with these features?

    ----

12. What is your professional status?
    ----

13. What is your age category?   (Please tick as appropriate)

    Under 25 ☐

    25-35 ☐

    ☐   255

36-45

46-55 ☐

Over 56 ☐

THANK YOU

Appendix 3: Face-to-face interview guide

Questions of semi-structured interviews focus on exploring the following issues:

Information needs of historians:

1. Needs that drive historians to do research
2. Needs that can be satisfied only by using original sources

   Or: situation(s) in which historians have to use originals

   Examples if needed: studying coins, paintings

3. Needs that drive historians to seek digitised sources

   Or: situation(s) where historians are satisfied by using digitised sources

4. Research question determines the choice of source type

Information-seeking behaviour of historians:

1. When seek original sources
2. When seek digitised sources

Information-seeking and the stimulation of creativity

1. Stimulating creativity

(Would you say that during information seeking you are always looking for opportunities to say something original about the topic under investigation?

Are there any specific ways in which you try to stimulate your creativity during information seeking? For example do you look for more material published in other subject areas or on the periphery of the topic you are investigating in order to get an outsider's view which might lead to an original interpretation?)

Ideal information retrieval system of digitised sources:

Invitation to think of:

1. What is missing in the current information retrieval system in an attempt to enhance this system?

   Or: which features do you think that would be helpful in stimulating your creativity?

    Probes:

   Type of access, metadata, training...

2. Do you need more information when searching virtually?

Appendix 4: Questions of e-mail interview

1- We are focussing on the role of creativity in historical research and your view about creativity. Can you think of any recent examples of when you have been creative in your work?

2- More specifically can you think of examples of occasions when your behaviour of information-seeking (looking for sources) helped to stimulate your creativity?

3- Can you think of any features that a computer-based information retrieval system could offer to help stimulate your creativity? In other words, what would you like to see is an information retrieval system of digitised sources that could help you being creative?

During the open coding each category was developed in terms of properties (characters) and dimension the "location of property along a continuum" (Strauss and Corbin, 1990: 61), and written in a memo as presented here.

Code Note: NEED AND ITS PROPERTIES AND DIMENSIONS
A NEED to do research has some general properties that can vary along a dimensional continuum.

General properties   possible dimensions

Type of NEED   interest   knowledge   career

Intensity   low   high

Duration   temporary   continuous

Number   one   multiple

A NEED to do research varies in type between being an interest, lacking knowledge or to career related one.

NEED varies in intensity between low and high.

NEED varies in duration from being temporary to continuous.

Also NEED varies in number from one to multiple.

Code Note: KNOWLEDGE AND ITS PROPERTIES AND DIMENSIONS
The state of personal KNOWLEDGE has a general property that can vary along the dimensional continuum as illustrated:

General properties   Possible Dimensions

State   low   high

When the state of KNOWLEDGE about a subject is low, there will be a need to do research to fill in the knowledge gap. By satisfying the information needs, the state of KNOWLEDGE will be high in which there is no need to seek more information. The less we know, the more we need to search.

Under the condition of lacking knowledge, historians seek information.

"What drive me is just recognising some gaps in the knowledge that information has not been collected before just is not there, so the starting point is there"

"I kind of came to realise that in Britain we do not really discuss politics very often, only a certain small percentage of people did this in other places in the world where political needs are perhaps more pressing in matters who gets into power more than anything else that I became interested"

Code Note: CAREER AND ITS PROPERTIES AND DIMENSIONS
CAREER motivation has some general properties and that vary along the dimensional continua:

General properties	possible dimensions
Degree of promotability	low fair high
Ability	good professional

CAREER motivation can vary in the degree of promotability from low, fair to high. For example; not having a good job can promote one person to get higher qualifications that allow him/her to get a better job. For example: "It is better than working on a building site which is what I was doing previously"

Realising how good are the abilities and skills that one has can vary also to affect CAREER motivation. Knowing strengths and skills would help in choosing the best career. For example: "it's one of the things that I am very capable in is actually writing about history"

Code Note: AVAILABILITY AND ITS PROPERTIES AND DIMENSIONS
AVAILABILITY as one aspect of driving historians to seek original materials has some general properties that can be varied along the dimensional continua.

General properties	Possible Dimensions
Degree of availability (quantity)	high low
Intensity (quality)	high low

Degree of consistency (context)	high	low

AVAILABILITY can vary in quantity from high to low. Having a plenty of documents will attract historians regardless of their format. Some historians mentioned that they were using originals because they are the only available format and the documents that they used were not yet digitised.

Code Note: PHYSICAL CONTACT AND ITS PROPERTIES AND DIMENSIONS

PHYSICAL CONTACT as a one aspect that drives historians to seek original materials has "frequency" as a general property that can vary along the dimensional continua:

General property	Possible Dimensions		
Frequency	Always	often	never

Although, historians prefer to physically access the document that they need, they do not do this always. They may not need to access their documents physically. Under the condition of having no need for the PHYSICAL CONTACT, they use digitised documents. With the condition of being always in need for the PHYSICAL CONTACT, using digitised documents will not help. The inevitability of accessing the original documents depends on many circumstances such as having no digital format, concerning the physical features of a document such as paper and ink type. Also, research habits or computer literacy may contribute to this isse.

Code Note: PRODACTIVTY AND ITS PROPERTIES AND DIMENSIONS

PRODACTIVTY as one aspect of driving historians to seek original materials has some general properties that can vary along the dimensional continua.

General property	Possible Dimensions		
Degree of PRODACTIVITY	high	low	
Income level	important	fair	
Duration (time)	hours	days	more

Productivity can vary in the degree from high to low and in the level of income from important to fair to not good. Also productivity can vary in the time that historians consume from hours to days or more.

Code Note: COST AND ITS PROPERTIES AND DIMENSIONS

COST is a main aspect of driving historians to seek digitised materials can vary its degree and type along a dimensional continuum:

General properties	Possible Dimensions		
Degree of COST	free	cheap	expensive
Type of COST	travelling	document usage	copying fees

COST can vary in degree between free of charge, cheap and expensive. Normally digitised materials are free or very cheap.

Also cost can vary in type to vary between travelling cost and staying in hotels if needed, in case of seeking originals, documents' usage if there is a charge for using documents whether they are digitised or originals. Also sometimes there is a copying fees that is applied in achieves if copies are needed.

Obviously, under the condition of free usage of document, the driver is high.

Code Note: ROUTINE AND ITS PROPERTIES AND DIMENSIONS
ROUTINE is an aspect of driving historians to seek digitised materials. ROUTINE has some general properties that can vary along a dimensional continuum:

General properties	Possible Dimensions		
Degree of ROUTINE	no routine	low	high
Type of ROUTINE	administrative	procedural	
Effect of ROUTINE	negative	positive	

ROUTINE can vary in degree between no routine, low routine and high routine.

Also ROUTINE can vary in type to vary between administrative and procedural. Administrative routine reveals the opening dates and time, which is related to the case of seeking original documents. Procedural routine is related to archives as well where historians need to arrange their visit to the archive in order not to waste their time and money and to make sure that the required documents are available.

The effect of routine, in case of seeking originals, can vary from negative to positive.

Obviously, under the condition of using digitised documents, there is no ROUTINE.

Under the condition of using original documents, ROUTINE is high.

Code Note: CONVENIENCE AND ITS PROPERTIES AND DIMENSIONS

CONVENIENCE is an aspect that drives historians to seek digitised materials. CONVENIENCE has some general properties that can vary along a dimensional continuum:

General properties	Possible Dimensions			
Degree of CONVENIENCE	low	high		
Type of CONVENIENCE	search	mental	physical	financial

CONVENIENCE can vary in degree between low and high.

Also CONVENIENCE can vary in type between searching conveniently, doing research and work in an appropriate time for historians. Physical convenience means that searching can be done in any place without the need to travel to remote archives. And the last type the financial one where historians do need to pay any money for using document or travelling around.

Obviously, under the condition of using digitised documents, CONVENIENCE is high.

Under the condition of using original documents, there is no CONVENIENCE or it is low.

Code Note: FINGERTIP ACCESS AND ITS PROPERTIES AND DIMENSIONS
ACCESS is the key aspect that motivates historians to seek digitised materials. ACCESS has some general properties that can vary along a dimensional continuum:

General properties	Possible Dimensions		
Degree of ACCESS	full	restricted	
Type of ACCESS	online	physical	
Speed of ACCESS	High	low	
Cost of ACCESS	free	low	high

ACCESS can vary in degree between full access and restricted access.

ACCESS can vary in type to vary between online access and physical access.

Also ACCESS is varied in its speed between high and low speed and it varies as well in the cost between free, low and high cost.

Under the condition of using digitised documents, ACCESS is full, quick and free.

Under the condition of using original documents, ACCESS is restricted to "physical access", costly, and consumes time.

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Code Note: SEEKING BEHAVIOUR AND ITS PROPERTIES AND DIMENSIONS

SEEKING BEHAVIOUR has some general properties that can vary along a dimensional continuum.

General properties	possible dimensions	
Type	browsing	direct search
Method	physical	online
Target	known	unknown
Intensity	low	high
Duration	short	long

SEEKING BEHAVIOUR varies in type between browsing, where need is not defined, and direct search where need is already defined.

SEEKING BEHAVIOUR varies in the methods that are followed between physical or online.

SEEKING BEHAVIOUR varies in target or need whether it is known and defined or not.

SEEKING BEHAVIOUR varies in intensity and being focused between low and high.

SEEKING BEHAVIOUR varies also in duration where it can take short or long time.

Code Note: IDENTIFYING NEEDS AND ITS PROPERTIES AND DIMENSIONS

IDENTIFYING NEEDS is the initial step of information-seeking behaviour of historians. IDENTIFYING NEEDS has some general properties that can vary along a dimensional continuum:

General properties	Possible Dimensions		
Source	secondary materials	catalogue	people
Duration	short	long	
Method	online	archives	

IDENTIFYING NEEDS can vary in the source or from where these needs immerged. These sources can vary between secondary readings, searching (online, paper) catalogue, or from people such as interviewee, archivist or colleague.

IDENTIFYING NEEDS can vary also in the time this stage takes between long or short period of time.

Also it can differ in the method used to IDENTIFY NEEDS between using online facilities and visiting archives to check some materials.

Code Note: FOLLOWING INFORMATION AND ITS PROPERTIES AND DIMENSIONS

FOLLOWING INFORMATION is the second step of information-seeking behaviour of historians. FOLLOWING INFORMATION has some general properties that can vary along a dimensional continuum:

General properties	Possible Dimensions		
Method		online	archives
Requirements	none	contacting archives	travelling

FOLLOWING INFORMATION can vary in the used method between online or going to archives and libraries. Also it can vary in the preparation of pursuing information between none, contacting archives in order to arrange for their visit to make sure that they can get what they need. Also one of these requirements is travelling to where the documents are.

Under the condition of using digitised materials, no arrangements or travelling are required.

Under the condition of using original materials, arranging with archivists and travelling are required.

Code Note: REFERENCING AND ITS PROPERTIES AND DIMENSIONS

REFERENCING or keeping a track of documents is another process of information-seeking behaviour. It has some general properties that vary along a dimensional continuum:

General properties	Possible Dimensions	
Degree	detailed	simple
Priority	high	low

REFERENCING can vary in degree between keeping detailed information about sources and keeping a simple record about sources.

Also REFERENCING can vary in its priority between high and low.

Under the condition of having a crucial source to the study, REFERENCING is important and should be detailed.

Code Note: JUDGING RELEVANCE AND ITS PROPERTIES AND DIMENSIONS

JUDGING RELEVANCE is a crucial process in information-seeking behaviour. It has some general properties that vary along a dimensional continuum:

General properties	Possible Dimensions		
Type of judgement	not relevant	might be relevant	relevant
Method	skim reading	intensive reading	

JUDGING RELEVANCE can vary in type between not relevant, might be relevant and keep it for future needs, or relevant.

Also JUDGING RELEVANCE can vary in the method used to judge relevance between quick or skim reading and intensive reading.

Under the condition of being in an early stage of research, judging is relevant or might be relevant.

Code Note: COPYING AND ITS PROPERTIES AND DIMENSIONS
COPYING or saving a copy of documents is another process of information-seeking behaviour. It has some general properties that vary along a dimensional continuum:

General properties	Possible Dimensions			
Type	handwriting	paper copy	digital copy	scanning photo Frequency
always	often		rarely	

COPYING can vary in type between having a handwriting copy, printed copy, digital copy and taking a photo of a document to save it as a digital photo.

COPYING also varies in frequency from always, often and rarely.

Code Note: ABSORBING AND ITS PROPERTIES AND DIMENSIONS
ABSORBING is another process of the information-seeking behaviour of historians. It has some general properties that vary along a dimensional continuum:

General properties	Possible Dimensions		
Method of ABSORBING	reading	thinking	
Type of ABSORBING	taking notes	summarising	locate and use document in research
Degree of ABSORBING	low	high	
Time of ABSORBING	instantly	later	

ABSORBING may vary in method between reading a document and thinking about it in order to locate it in the undertaken research.

ABSORBING varies in type from making notes to summarising to using a document in research.

ABSORBING varies in degree from low to high.

ABSORBING also varies in time from being performed instantly (where some historians read and think about a document immediately after finding it) or leaving this task for later.

Code Note: CREATIVITY AND ITS PROPERTIES AND DIMENSION

CREATIVITY is an important kind of behaviour for historians and it is interesting to know how they understand it. CREATIVITY can vary in its general properties over a dimensional continuum.

General properties	possible dimensions		
Degree of CREATIVITY	low	moderate	high
Meaning of CREATIVITY	not sure	originality	productivity

CREATIVITY can vary in degree from low or not being creative to high level of creativity.

CREATIVITY varies in meaning from the perspective of historians between not sure about the meaning of creativity to originality and productivity.

Under the Condition of low level, historian is not sure about creativity.

Under the condition of moderate level, creativity means originality to historian.

Under condition of high level, creativity means productivity to historian.

Under the condition of SEEKING INFORMATION, historian ends up with CREATIVE ideas.

"but yes its that finding new facts and then being able to reinterpret them is the creativity that I would bring to it, hopefully lots of new information as a result"

"its more like you come away with all that stuff and then you start doing things with it and its when you start doing things with it that it feels more creative, when you start writing it up and using it for a piece that you're writing"

"Recently I have been working on how a particular military term (fencible) became popular as a description for a type of military force in the late eighteenth century. To do this has required a different approach to the records I have used before (War Office records in the National Archives, Kew) to trace the emergence and development of this word, rather than focusing on what the documents tell us about the running of the British Army in the period"

"I think it's more the other way round, that seeing directions, having ideas about what's going on that directs my research. So I think there is a connection between the way I work and my creativity, but I think the creativity drives the direction of the research rather than it being the other way round"

"I find using EEBO and ECCO (as well as archives) always very helpful. One search often leads to new discoveries"

"The main creative act is to allow the research to stray a little and discover serendipitous holdings which may be of use now or later"

" I don't call it creative or anything, I just suggest that you're actually looking at material, looking at ideas and seeing whether the evidence supports it or not and that's really what a lot of history is"

Code Note: REDIRECTING RESEARCH AND ITS PROPERTIES AND DIMENSION

REDIRECTING RESEARCH is one way of stimulating the creativity of historians. REDIRECTING RESEARCH has some general properties that vary along a dimensional continuum:

General properties	Possible Dimensions			
Type of direct	widening	side-track	narrowing	linking
Degree of research intensity	Straying	serendipitous	focused	
Degree of redirecting	slight	big		
Frequency of redirecting	sometimes	often	a lot	
Potential for exceeding researches limits	low	high		

REDIRECTING RESEARCH can vary in type between widening the scope of research, having a side track, narrowing down the research scope, and creating a link between two different areas.

REDIRECTING RESEARCH can vary in intensity from straying and not being focused to serendipitous where depending on chance to find good documents, and to being focused.

REDIRECTING RESEARCH can vary in degree from slight change in research direction to a big change.

REDIRECTING RESEARCH varies in frequency between sometimes, often and a lot.

REDIRECTING RESEARCH also varies on the potential for exceeding research's limits between low and high. For example, widening research or going side-track may cause time consuming and not being focused.

Code Note: INTERACTING AND ITS PROPERTIES AND DIMENSION

INTERACTING is another way of stimulating the creativity of historians. INTERACTING varies in type and level along a dimensional continuum:

General properties	Possible Dimensions		
Type of INTERACTING	formal		informal
Level of INTERACTING	high	cautious	low

INTERACTING can vary in type between formal way as participation in conferences and academic discussion, and informal way of interaction with colleagues.

INTERACTING also can vary in the level between high, cautious and low. Some historians found interaction with others as a good opportunity to stimulate their creativity and open up their thoughts, while others were cautious about sharing ideas and perspectives especially if they are not published yet. On another hand, other historian may feel isolated because it is rarely to find researchers or PhD students who have the same interest, adding that doing research is an individual work.

Code Note: AVAILABILITY OF SOURCES AND ITS PROPERTIES AND DIMENSION

AVAILABILITY OF SOURCES is another way of stimulating the creativity of historians. AVAILABILITY OF SOURCES varies in type, degree and frequency along a dimensional continuum:

General properties	Possible Dimensions		
Type of SOURCES	digitised		originals
Degree of AVAILABILITY	high		low
Frequency of access	always	often	rarely

SOURCES can vary in type between digitised and original sources and vary in its degree of availability from high to low. Frequency of accessing SOURCES also can vary between always, often and rarely. Some historians direct their research towards the available sources that can be easily accessed, while others work with sources that are rarely accessed and difficult to find.

Code Note: BEING INSPIRED BY OTHERS AND ITS PROPERTIES AND DIMENSION

BEING INSPIRED BY OTHERS' WORKES is another way of stimulating the creativity of historians and this can varies in type or way of inspiration along a dimensional continuum:

General properties	Possible Dimensions	
Type of inspiration	imitate	differ

BEING INSPIRED BY OTHERS can vary in type between imitating others and doing completely a different work.

Code Note: THINKING AND ITS PROPERTIES AND DIMENSION

THINKING is another way of stimulating the creativity of historians and this can varies in type along a dimensional continuum:

General properties	Possible Dimensions		
Type of THINKING	innovative	conceptual	critical

THINKING can vary in type between being innovative (trying to generate new idea or new way of approaching things) or conceptual (connecting ideas or information together to form a complete picture) or being critical by analysing, evaluating information, arguments, and turning around preconceptions.

Code Note: SEARCHING FACILITIES AND ITS PROPERTIES AND DIMENSION

SEARCHING FACILITIES as a way of developing an information retrieval system of digitised documents to stimulate the creativity of historians has some general properties that can be varied along the dimensional continua:

General properties	Possible Dimensions		
Degree of searching	text	basic	advanced
Type of searching	backward	forward	citation

SEARCHING can vary in degree from searching a text, which is very important to have when using digitised documents and deal with document as a searchable text not as a digital image, to perform a basic search, and last to have an advanced research facility where it is possible to be more specific by defining search categories.

SEARCHING varies also in the type from backward searching, forward searching and citation search. Backward searching helps keep a history of search in order not to lose the track of accessed documents, while forward searching can indicate which document may be related to

the one that in use or what did others used beside this current one or what were they interested in further. Citation search shows who did use and cite this document.

Code Note: CATALOUGING AND ITS PROPERTIES AND DIMENSION

CATALOUGING is the service that helps in developing an information retrieval system of digitised documents to stimulate the creativity of historians. CATALOUGING varies in the intensity of contents along a dimensional continuum:

General properties	Possible Dimensions		
Intensity of contents	low	basic	rich

CATALOUGING can vary in the intensity of contents from low (information about sources are not enough or some resources are not included in the catalogue), to basic information about sources, and rich content of catalogue in which all information that can help in describing information sources are stated such as: language of resource, type of writing language, or including a ample of a documents etc...

Code Note: INDEXING AND ITS PROPERTIES AND DIMENSION

INDEXING is another type of the service that helps in improving and speeding the information retrieval. INDEXING varies in its accuracy along a dimensional continuum:

General properties	Possible Dimensions	
Degree of accuracy	low	high

INDEXING varies in its accuracy between low and high. Documents sometimes are not catalogued and categorised accurately and photographs are hardly indexed. Historians mentioned that indexing terms are subjective and do not reflect what historians need.

Code Note: ABSTRACTING AND ITS PROPERTIES AND DIMENSION

ABSTRACTING is the service that helps in developing the information retrieval system of digitised documents to stimulate the creativity of historians. ABSTRACTING has some general properties that vary along a dimensional continuum:

General properties	Possible Dimensions	
Availability	no	yes

Intensity of contents		poor	good	rich
Type of information	descriptive	subjective	professional	analytical

ABSTRACTING can vary in its availability between being prepared "yes" and being absent "no". ABSTRACTING varies in the intensity of contents from having poor, good and rich contents.

Also ABSTRACTING can vary in the type of information provided between descriptive (describing content of image or photos), subjective (reflects the archivists' perspectives and experiences), professional and analytical where historians can be involved in writing the abstracts to reflect the perspectives of historians.

Code Note: COPYRIGHT AND ITS PROPERTIES AND DIMENSION

COPYRIGHT is an important aspect in judging the authenticity of documents especially for online materials. COPYRIGHT has some general properties that vary along a dimensional continuum:

General properties	Possible Dimensions		
Degree of importance	low	high	
Frequency of indicating the source of documents	always	often	rarely

COPYRIGHT vary in its importance from low to high. Copyright is very important to assure the authenticity and reality of documents especially in the case digitised documents.

COPYRIGHT also can vary in the frequency of indicating the source of documents between always, often and rarely. It is not common in the archives to indicate the source of documents and this issue could be a subject to the data protection acts.

Code Note: STATISTICS AND ITS PROPERTIES AND DIMENSION

STATISTICS is a good aspect that can help in enhancing the information retrieval system of digitised documents and it can be a good source of information for historians. STATISTICS can vary in type along a dimensional continuum:

General properties	Possible Dimensions		
Type of STATISTICS	access	usage/citation	rate

STATISTICS vary in its type between statistics about the most accessed documents, using or citing and also the top rated documents or collection. Some historians are interested in knowing the most accessed documents or the least accessed.

Code Note: INTERACTING AND ITS PROPERTIES AND DIMENSION

INTERACTING as a way of developing the information retrieval system of digitised documents has some general properties that can be varied along the dimensional continua:

General properties	Possible Dimensions			
Degree of INTERACTING		low		high
Type of INTERACTING	sharing	leaving comments/feedback	discussion	
		recommendation	tagging	

INTERACTING varies in degree from low interacting due to lacking of peers who are interested in the same area; to high level of interacting.

Also INTERACTING can vary in the type between sharing documents and perspectives, leaving comments or feedbacks, having a discussion with colleagues, making recommendations and tagging information sources.

Code Note: TRAINING AND ITS PROPERTIES AND DIMENSION

TRAINING is the facility or service that helps in developing historians' skills in dealing with the information retrieval system of digitised documents. TRAINING has some general properties that vary along a dimensional continuum:

General properties	Possible Dimensions		
Type of training	online tutorial	video instructions	course
Level of training	internet literacy	intermediate	advance
Focus of training	doing search	using documents	saving documents

TRAINING can vary in type between offering an online tutorial, short video (showing how to navigate through the information retrieval system), quick instructions or a traditional course;

TRAINING varies in level as well from the very low level or internet literacy, intermediate where historian has some basic knowledge of using information retrieval system, to advanced level where historian is experienced with information retrieval systems and searching skills.

Also, TRAINING can vary in it is purpose between doing research and using the proper search term, downloading and saving documents.

Code Note: TEXT AND ITS PROPERTIES AND DIMENSION

TEXT is another general property of digitised document that contributes in enhancing the information retrieval system to stimulate the creativity of historians. This property varies over a dimensional continuum:

General properties	possible dimensions		
Accuracy of TEXT	high	low	
Type of TEXT	searchable	image	translated copy
Font of TEXT	old	modern	

TEXT can vary in accuracy from high (where digitised text is an exact copy from the original source without amending or changing in spelling or using modern language) to a low level of accuracy.

TEXT can vary in type between being a searchable text or just a digital image of originals or a translated copy of originals especially in the case of being written in old and foreign languages. Sometimes it is helpful to have a translated copy or modern language copy along with the original text.

Also TEXT can vary in font between being old and modern type.

Code Note: SCOPE AND ITS PROPERTIES AND DIMENSION

SCOPE is a vital property of digitised documents that contributes in enhancing the information retrieval system to stimulate historians' creativity. This property varies over a dimensional continuum:

General properties	possible dimensions	
Quantity	small	large
Supply	little	more

SCOPE of documents or collection can vary in its range or quantity between small and large.

SCOPE of documents or collection also can vary in the way of supplying the repository between little and more where historians expressed their need of increasing the scope and having more online documents.

Code Note: PROFILE AND ITS PROPERTIES AND DIMENSION

Having a PROFILE or personal database on the information retrieval system could improve this system and stimulate the creativity of historians. PROFILE varies in its general properties along a dimensional continuum:

General properties	Possible dimensions	
Type of PROFILE	personal	affiliated
Type of facilities	basic	advanced
Degree of management	low	high

Profile can varies in type between personal and affiliated and more likely in this case to be affiliated.

PROFILE varies in type of facilities provided between basic (adding or downloading article, sending, leaving comments and note) to more advanced ones (annotating, interacting, subscribing and tagging).

PROFILE also varies in the degree of management between low and high management facilities especially in terms of information security.

Code Note: SYSTEM AND ITS PROPERTIES AND DIMENSION

Having a friendly-user SYSTEM is a general property of enhancing the information retrieval system to stimulate the creativity of historians. This property can vary along a dimensional continuum.

General property	possible dimensions	
Level of flexibility	low	high
Level of maintenance	low	high
Navigation	difficult	easy

SYSTEM can vary in the level of flexibility from low to high. Some historians mentioned that some systems do not work with their old PCs which caused them a problem in accessing materials.

Also SYSTEM can vary in the level of maintenance from low to high, while it is important to have an up-to-date system especially in terms of searching facilities and dealing with text.

SYSTEM can vary in navigation and usage between easy and difficult where it is helpful sometimes to give some instructions about using system.

Code Note: PROFESIONAL ASSISTANCE AND ITS PROPERTIES AND DIMENSION

Getting a PROFESIONAL ASSISTANCE and considering the experience of historians would be a sufficient way to enhance the information retrieval system. This assistance has some general properties that vary over a dimensional continuum.

General properties	Possible dimensions		
Type of assistance	process	historical	linguistic
Level of assistance	low	high	
Method of assistance	formal	informal	
Target of assistance	administrator	users (historians)	

PROFESIONAL ASSISTANCE can vary in type between helping in the process of making documents available online such as in cataloguing, indexing, and abstracting. Another type of ASSISTANCE is historical and taking in account the experience of historians in helping archivists, and linguistic where sometimes documents are in foreign or old languages.

PROFESIONAL ASSISTANCE varies in level between low and high.

PROFESIONAL ASSISTANCE also varies in method of getting or requesting help between formal and informal.

PROFESIONAL ASSISTANCE varies in type of who can receive it between administrator and users or historians.

Code Note: HISTORICAL RESEARCH AND ITS PROPERTIES AND DIMENSION

HISTORICAL RESEARCH has some general properties that make it somewhat special. These general properties can vary along a dimensional continuum.

General properties	Possible dimensions		
Focus of research	events	sources	evidence
Method of research	interpreting	analysing	imagining
	Reconstruction	combining	

HISTORICAL RESEARCH varies in its focus or main concern between past events, sources, and evidence.

HISTORICAL RESEARCH also varies in method between interpreting, analysing, imagining, reconstructing, and combining.

Code Note: COMBINING AND ITS PROPERTIES AND DIMENSION

COMBINING is somehow a unique aspect of doing research in history. COMBINING has some general properties that can be varied along the dimensional continua:

General properties   Possible Dimensions

Degree of combination   usual   reconstructive   creative

What to combine   imagination   with evidence

                                                          creativity with subjectivity

                                                          interpretation with evidence

COMBINING varies in degree from usual combining to reconstructing to a more advanced degree which is the creative one.

COMBINING also can vary in the aspects that have been combined together such as integrating imagination with evidence, creativity with subjectivity and interpretation with evidence.

Code Note: CAUTIOUS ABOUT DIGITISATION AND ITS PROPERTIES AND DIMENSION

CAUTIOUS ABOUT DIGITISATION has some general properties that vary over a dimensional continuum.

General properties   Possible dimensions

Degree of CAUTIOUS   low   high

Type of CAUTIOUS   archives' services   selection strategy of digitisation

                                          information technology   accessing method

Being CAUTIOUS ABOUT DIGITISATION can vary in degree from low (where historians are enthusiastic to digitised documents and new IT) to high where this enthusiastic is very low and historians are very loyal to original sources.

CAUTIOUS ABOUT DIGITISATION also varies in type or issues between being cautious about the archival services (where the quality of these services may deteriorate or archives may close down). Selection strategy of digitisation is another issue of caution in terms of who select documents and standards for selection and the quantity of documents. Furthermore,

historians were cautious about using information technology and the methods of accessing digitised documents as well.

Appendix 6: Coding tree

Name		Sources	References	Created On
Need		0	0	09/12/2011 01:03
Interest		5	20	06/12/2011 00:34
Knowledge		6	13	13/11/2011 21:27
Career motivation		3	8	06/12/2011 02:02
Drivers to seek		0	0	08/12/2011 02:23
Drivers to seek originals		0	0	09/03/2012 22:43
Availability of originals		6	15	16/11/2011 01:32
limitation of digitising		7	40	19/11/2011 02:44
Context		3	12	16/11/2011 01:49
Specific area		1	2	19/11/2011 02:47
Physical contact		4	7	18/11/2011 00:47
Reinforcing the originality of research		2	7	22/12/2011 02:29
Authenticity		2	6	22/12/2011 02:40
Productivity		2	7	03/01/2012 01:38
Concentrating		1	3	16/06/2012 23:57
Drivers to seek digitised documents		0	0	08/12/2011 02:38
Cost		6	18	16/11/2011 01:36
Routine		5	11	16/11/2011 01:39
Convenience		10	57	19/11/2011 02:28
Finger tip access		11	64	21/11/2011 02:51
Seeking behaviour		0	0	03/05/2012 00:16
Identifying needs		7	20	03/05/2012 00:16
Follow information		3	5	03/05/2012 00:16
Locating		6	31	03/05/2012 00:16
Travelling		3	8	03/05/2012 00:16
Arranging the visit with archivist		3	9	03/05/2012 00:16
Access		3	5	31/08/2012 10:58
Referencing		5	16	03/05/2012 00:16
Judging relevance		2	10	03/05/2012 00:16
Copying		8	44	03/05/2012 00:16
Absorbing		3	13	03/05/2012 00:16
Creativity		17	36	24/12/2011 03:14

Stimulating creativity		0	0	08/12/2011 04:11
Redirecting research		2	5	21/11/2011 02:17
Narrowing down research		7	15	06/05/2012 00:13
Broad research context		1	2	26/06/2012 00:22
Linking up		5	23	14/06/2012 00:14
Creating tangent area between different areas		8	17	06/05/2012 00:13
Elaborating arguments from a bit of evidence		4	9	06/05/2012 00:15
Creativity methodological rather than just a subje		7	13	22/11/2011 02:52
Fuzzy research		5	12	27/05/2012 02:22
Serendipity		11	25	27/05/2012 02:56
Finding evedince for argument		3	6	24/07/2012 14:09
Interacting		11	38	24/12/2011 05:23
Resources		12	30	30/12/2011 02:49
Working with real original document		7	11	24/12/2011 05:54
Sources that are rarely accessed or used		3	15	27/06/2012 13:52
Being inspired		11	23	22/11/2011 02:16
Thinking		10	35	27/06/2012 13:47
Enhancing digitised retrieval system		0	0	08/12/2011 03:58
Searching facility		8	21	05/01/2012 07:03
Featuring advanced search		10	27	22/11/2011 02:51
Forward chianing		6	11	04/01/2012 05:44
Show citation		4	8	04/01/2012 05:57
Searchable text		11	23	21/11/2011 02:56
Metadata		7	17	13/11/2011 02:19
Cataloguing		12	27	22/11/2011 01:35
Language and text		2	3	23/11/2011 00:33
Sample of document		2	5	23/11/2011 00:36
Updating catalogue		2	5	04/01/2012 06:49
Indexing		6	13	29/12/2011 03:09
Abstracting		8	32	22/11/2011 03:11
Copyright		2	4	30/12/2011 04:29
Source of document		2	9	04/01/2012 05:51
Statistics		4	6	30/12/2011 04:42
Interacting tools		8	20	08/12/2011 04:18
Sharing perspectives		12	20	23/11/2011 01:41
Commenting on documents		8	21	23/11/2011 01:35
Tagging		5	10	04/01/2012 05:27

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Training	🔵	8	25	13/11/2011 02:21
Doing search		6	16	08/12/2011 03:54
Internet literacy		6	21	08/12/2011 03:54
Training videos		3	7	22/11/2011 02:53
Digitised documents		0	0	07/08/2012 15:47
Text	🔵	2	13	12/07/2012 13:18
Scope	🔵	12	24	30/12/2011 03:09
Profile	🔵	5	14	03/01/2012 13:20
keeping a history of research		3	8	04/01/2012 05:40
System	🔵	9	20	31/05/2012 09:17
Professional assistance	🔵	4	12	07/07/2012 01:11
Historical research	🔵	1	1	18/05/2012 23:49
Combining	🔵	1	3	18/05/2012 23:26
Interpreting by evidence		3	6	18/05/2012 23:44
Imagining		1	2	18/05/2012 23:37
Reconstracting		2	2	18/05/2012 23:28
Dealing with the past		4	7	18/05/2012 23:30
Source-centred research		4	6	31/05/2012 11:00
Analysis		1	1	02/06/2012 00:02
Cautious about digitisation	🔵	7	33	04/01/2012 06:43

Assessing the information needs of historians working with digitised primary sources in the UK: a sequential mixed methods study

You are being invited to participate in this research study. Please take your time reading this information before accepting this invitation or not.

This study entitled above aims to to identify the best composition of information retrieval systems of digitised historical sources by assessing the information needs and modeling the information seeking behaviour of historians dealing with original and digitised primary sources.

Interviewing historians is so important to the study in order to understand their research strategies when looking for and using original sources and also when interacting with information retrieval system of digitised sources. This will assist in identifying the "ideal" information retrieval system of digitised sources from the perspectives of historians and the ways that could stimulate the historians' creativity.

Data gathered from the interview will be stored and used anonymously and confidentiality only for the purpose of this academic research in accordance with the University of Huddersfield recognised research programme and ethical guideline.

This study is purely conducted at university self-funded research and fully reviewed by supervisory team.

You have the right to accept the participation in this research, as also you are willing to withdraw from the interview at any time you want.

Please feel free to ask any question if you want to explore more about this research before starting the interview.

For further information please contact me: l.hassan@hud.ac.uk

Thanks for taking time reading this information.

Assessing the information needs of historians working with digitised primary sources in the UK: a sequential mixed methods study

PhD student: Luna Hassan
Address: Informatics Department
Computing & Engineering School
University of Huddersfield
Queensgate
Huddersfield
HD1 3DH

1- I confirm that I read and understand the information sheet of entitled study and I had the opportunity to ask questions ☐

2- I understand that my participation is voluntary and that I have the right to withdraw at any time, without giving reason ☐

3- I agree to participate in this study ☐

4- I agree the interview to be audio recorded ☐

5- I agree the interview data to be stored securely in the University repository and used anonymously in this research ☐

Name of participant   Date   Signature

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Name of researcher   Date   Signature

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Appendix 9: HistoryBook application

HistoryBook is an application based on Web 2.0 tools that serves scholar historians working with archival material. HistoryBook functions as:

- Personal database in which historians can share archival materials that one historian work with or interested in to own profile, so all his/her materials are saved together along with pertaining notes in one save place.
- Network place where historians can connect to and interact with other historians who are sharing the same interest or from different disciplines on HistoryBook.

HistoryBook application is based on assumptions of:

- This application is incorporated with online archives;
- Archival materials are digitised and accessed online;
- Archival materials are open sources and available to share;
- Copyrights of archival materials are maintained by Watermark;
- Personal information of historians is treated under the Act of Data Protection.

Creating and managing profile

Historians are required to create a profile by signing up with a name and valid e-mail address, and then they can provide as much information as they want regarding their education, research need and interests. Historians' needs and interest are used by the application to recommend historians other sources that may be of interest, profiles of other historians who share the same research interest to connect with.

Historians can control the visibility of their information and manage security settings by making it public or private.

Historians are able to do:

- Post a topic or idea for discussion, upload photos or digital image of historical record.
- Invite other historians (profiles) for a discussion.
- Find historians with the same research interest by searching his area of interest under index terms to find a list of profiles that indicate the same interest and connect to, or by using the *Recommend* function where HistoryBook provides a list of similar profiles based on information provided by historian about his/her research interest.
- Create a network by connecting to other profiles that share the same interest or from other disciplines.
- Share records, images and sources of interest to own or others' profile connected with.
- Annotate on shared sources in which historians can write their notes, ideas, and analysis and link them to a particular record or piece of information. Security setting for these annotations is applicable to secure original ideas.
- Comment on shared sources on own and others' profiles.
- Tag information contents.
- Organise or classify sources, information and notes into files to facilitate their retrieval.
- Receive notifications of others' activities such as posts, comments on own post and sources, or if others comments on a source that historians commented on before.
- Receive news feeds pertaining to historian's interest and research needs and recommendations based on his/her web experiences or shared sources.
- Getting help or hint is available for the application as a whole (5 minutes video) or for separate functions in a format of small text window.
- Retrieve search history on incorporated archives.
- Interact and send messages to profiles connected with.

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