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Creating Context from Curiosity: The Role of Serendipity in the Research Process of Historians in Physical and Digital Environments

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Abstract

Serendipity, the word used to describe an unexpected encounter with information, people, or objects, has drawn much scholarly attention since its 1754 coinage by Horace Walpole. Historians commonly use this term when describing unexpected encounters during their research. However, historians have also been shown to be meticulous, organized researchers whose work is unlikely to contain elements that are unexpected. This thesis is an investigation of serendipity as it is recognized, defined, and experienced by historians in both physical and digital environments. Article One presents a grounded theory analysis of 20 interview transcriptions, Article Two presents a combination of grounded theory, content analysis, and narrative analysis of historians' responses to an online survey, and Article Three summarizes the quantitative responses to the same survey, but focuses on digital environments. In Article One it was found that historians frequently used active verbs to describe serendipity, and concluded that agency plays a prominent role in these experiences. In Article Two, survey responses from 142 participants reinforce the importance of agency, demonstrating that active research methods lead them to these serendipitous encounters. Article Three reports on the features of digital environments that historians found to support serendipity, including those that encourage exploration, connect people, have options for keyword searching, and highlight potentially relevant links. Taken together, these articles comprise a thesis that advances our current understanding of serendipity. Contributions to the field of LIS include acknowledging the role of agency in serendipitous encounters, and the use of multi-method analysis for investigating serendipity in a single population.

Keywords

Co-Authorship Statement

The three articles that make up the body of this thesis are intended for individual publication. Article One is currently under revision for resubmission to the *Journal of Documentation*. Article Two will be submitted to *Information Research*. Article Three will be submitted to *Digital Humanities Quarterly*.

All three articles have been co-authored with Anabel Quan-Haase, the thesis supervisor. For each of the articles, the research contributions were as follows:

First author: Kim Martin, Doctoral Candidate

First author's contribution: Performed data collection, data analysis and interpretation, writing of the article, and acted or will act as the corresponding author on each publication.

Second author: Anabel Quan-Haase, Supervisor

Second author's contribution: Supervised the analysis and development of each article and edited each manuscript.

Dedication

For my Mum, who jumped up and down with me upon my acceptance into a PhD Program, and for Henry, who jumped up and down with me when the ride was over.

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Finally, I am thankful for my family. To my Dad (Paski), who has supported me through my entire education (I'm really really done now!). To my cousin Erica, who once warned me of the lonely path of a PhD student, and whose friendship has made it anything but. To Dave, who has patiently supported me on this adventure, and never once doubted me, or let me doubt myself. And to my sweet Henry, who, after all this time, can finally stop telling people his Mum is still in school. I love you Beanie.

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Introduction

In the year 2000 the word 'serendipity' was chosen as people's favorite word in the United Kingdom, followed closely by 'quidditch' (a salute to Harry Potter), and the emotional terms 'love', 'peace', and 'hope' (BBC, 2000). What is it about serendipity that piques people's interest? Is it the concept of undiscovered territory or knowledge just beyond the horizon, or is it the puzzlement and surprise that come with its unfamiliarity, the "element of whimsy" associated with the word (Merton & Barber, 2004)? When Horace Walpole coined the term serendipity in a letter to Horace Mann on January 28th, 1754, he scarcely could have guessed the adoption and usage of this word would expand continually into the 21st century.[1] The "accidental sagacity" of Walpole's definition was determined through a re-assembling of parts of a fairy tale with which he was familiar, titled *the three Princes of Serendip* (Merton & Barber, 2004). The background to this tale differs from culture to culture and has lost its prominence with time, but Walpole's concept has continued to fascinate people for nearly three centuries, with an increase of interest through to present day. As a demonstration of this interest, Figure 1 shows the number of times the word serendipity appeared in English language books included in the Google Books Project that were published in any country from 1930 through until 2013.

Scholars from many different fields have discussed the concept of serendipity, or the chance encounter with information, in their research. Academics have pursued an understanding of serendipity in a variety of studies and reflection pieces, as indicated in Figure 2, which shows the number of journal articles from the JStor database containing the word serendipity from 1930 to 2013.[2] Amongst these scholars are scientists who have shown the importance of keeping an open and creative mind during the scientific process

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[1] For a full description of the coining of the term serendipity, see Merton and Barber, 2004.

[2] JStor, short for Journal Storage, is an online collection of academic journals, books and primary sources. See www.**jstor**.org/ for more information. The tool used to create the graph in Figure 2 is Data For Research (DFR) tool, a free tool that is currently in beta. The dip in the number of articles that mentioned serendipity after 2010 is quite curious, but might have something to do with the journals currently included in DFR, at the moment, are only articles published prior to 2013.

and how discovery of scientific findings can occur when proper connections are noticed and acted upon (Barber & Fox, 1958), and lawyers and historians who have written about the
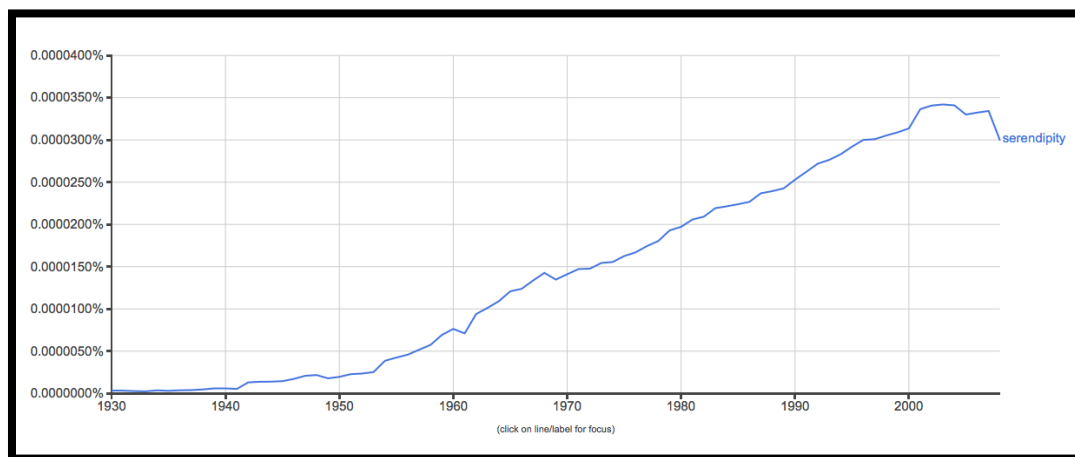
Figure 1 Use of the Word "Serendipity" in Books, 1930-2013

(Google NGram viewer)
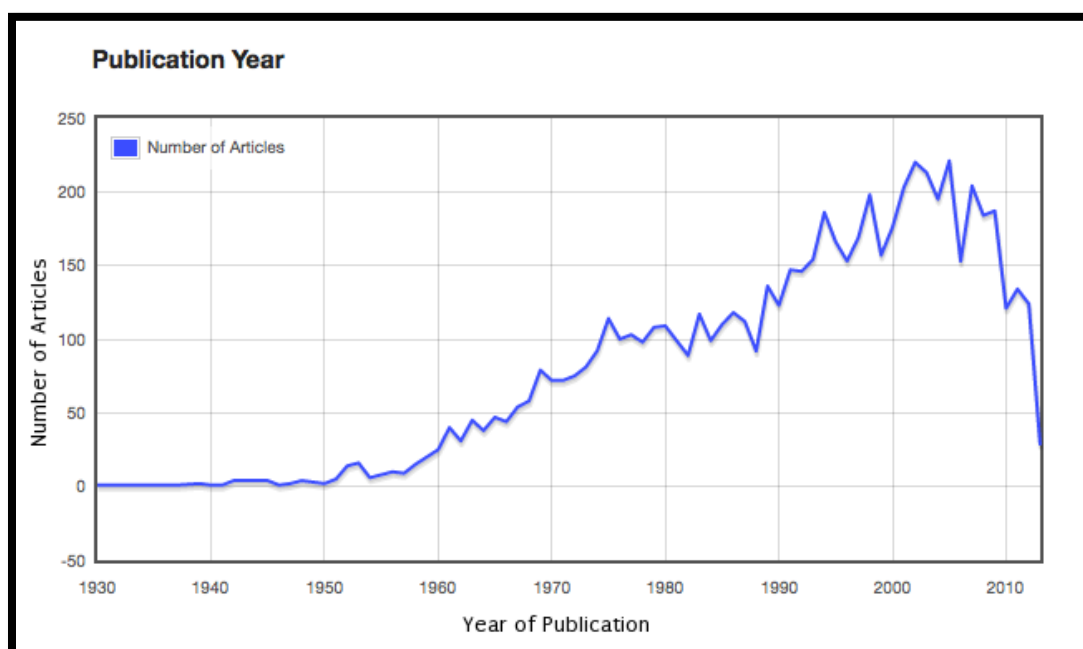
Figure 2 Use of the Word "Serendipity" in Journal Articles, 1930-2013

significance of unanticipated findings in the libraries and archives in which they do their work (Hoeflich, 2007; McClellan III, 2005).

There have been many attempts, in the past decade alone, to understand the phenomenon that is serendipity and to create ways of fostering this experience (André, Schraefel, Teevan, & Dumais, 2009; Björneborn, 2008; Johnson, 2010; Makri, Blandford, Woods, Sharples, & Maxwell, 2014). In the field of Library and Information Science (LIS), researchers have looked at blogs (Rubin, Burkell, & Quan-Haase, 2011), digital library catalogs (Race, 2012), web searching (Erdelez, 2004), and networks of information acquisition (Williamson, 1998) in order to try and understand the phenomenon of the chance encounter. And it is not just the digital environment that holds interest for these scholars. Björneborn (2008) investigated users interactions with the physical library stacks to see what aspects held possibilities for serendipity. Hinze, McKay, Vanderschantz, Timpany, and Cunningham (2012) investigated book selection behavior in the physical library, and McKay, Smith, and Chang (2014) looked at the borrowing rates of neighbouring books. Both of these studies contemplate ways that the physical library interface lends itself to the serendipitous experience.

Many scholars, including several already mentioned, have noted the difficulties associated with studying serendipity. It has been called a 'slippery' phenomenon by Makri and Blandford (2012), who claim that "different people have different understandings of serendipity and these understandings are likely to change and perhaps evolve as they are challenged by new (and different) experiences" (p. 2). There exist in the literature a wide variety of models and definitions of serendipity, many of which will be covered in the literature review below. Perhaps even more problematic than the slippery definitions of serendipity, however, is its subjective nature (Iaquinta et al., 2008; Makri et al., 2014; McCay-Peet, 2013b). How to study a concept that means many different things to different populations, especially where one person's serendipitous experience might mean nothing to someone else?

The primary way of doing this for LIS researchers has been to study a select population and the ways in which this population experiences and understands serendipity. Foster and Ford (2003) investigated interdisciplinary scholars and found that they regularly experienced serendipity, but had mixed perceptions about whether or not it could be induced. Makri et al. (2014) interviewed creative professionals and determined that they used a number of strategies to increase their chances of experiencing serendipity. McCay-Peet and Toms (2010) examined interviews from ten historians for instances of serendipity and found that there were two conditions that were ripe for this experience: active learning and social networks. Dantonio, Makri and Blandford (2012) examined 15 postgraduate students to see if they came across academic content serendipitously while using social media. Their results showed that serendipitous connections with academic content did occur, but that the postgraduate students had to be willing to invest time in social media when there was no guarantee of a positive result. Outside of academia, Pálsdóttir (2010) investigated information encountering by Icelanders in regards to their health and lifestyles and found that those who purposely pursued information were more likely to also encounter information by chance, and that the combination of these habits formed a pattern of serendipitous information seeking.

This thesis takes historians as its population of study. The three papers that make up the body of the thesis analyze the findings of interviews and surveys with historians, regarding the role of serendipity in their research. Historians were selected as the population for a number of reasons. Historians make good use of the library and archives (Duff & Johnson, 2002; Emmick, 1989; Uva, 1977), two environments which have been shown to foster serendipitous experiences (Björneborn, 2008; Case, 1991; Thudt, Hinrichs, & Carpendale, 2012). Historians themselves often write about their own experiences with serendipity (Hoeflich, 2007; Kirsch & Rohan, 2008; McClellan III, 2005; Nissenbaum, 1989), allowing for rich insights into this process prior to the design of the study and throughout the stages of analysis. And finally, I was trained as a historian and therefore had a good understanding of their research habits and information seeking practices.

This thesis, then, provides an investigation of serendipity as it is perceived, defined, and experienced by historians. It advances the study of serendipity by applying several forms of analysis (grounded theory, content analysis, and narrative analysis) to data collected from a single population. Historians are asked to define and describe their experiences with serendipity during their research in order to determine if the elements of the definitions they provide are found in the serendipity stories they tell. The thesis also is concerned with the information environments in which these scholars work, and the ways that historical research practices, (and the serendipity experienced in them), change when taking place in a digital or physical context. Three main questions guide the investigation:

1. How do historians experience serendipity in digital and physical information environments?
2. How do historians understand the concept of serendipity as it pertains to their research?
3. What lessons have been learned about how best to support serendipity for historians working in the digital environment?

This introductory chapter is organized as follows: Section 1.1 reviews the surrounding literature that both grounds this study and points to the gap in the research that it seeks to fill. This includes A) a review of the models and frameworks that LIS scholars have employed when studying serendipity, and B) a review of the information practices of historians from an LIS perspective. Here, two related topics will be covered: The use of technology by historians, and the links between browsing and serendipity in historical research. Section 1.2 outlines the intent of the thesis, and summarizes the studies that are then described in detail in sections 1.3, 1.4, and 1.5. Section 1.6 outlines the role of the researcher throughout the thesis process, highlighting how previous experiences led to the creation of these questions and informed the choices that were made throughout the study. Section 1.7 details the choice of the integrated article format of the thesis, while Section 1.8 outlines the research contributions it makes. Finally, the conclusions in Section 1.9 reunite all three papers with unifying themes that will be revisited in the final concluding chapter of the thesis.

1.1 Review of the Literature

1.1.1 Serendipitous Discovery: Models and Frameworks

The concept of serendipity has been examined in a variety of contexts, and most of these studies have resulted in the development of models that attempts to describe this notoriously elusive concept. Several of the most recent models are described below in order to provide a thorough background for the current investigation.

In her early introduction to Information Encountering (IE), Erdelez (1999) writes about the growing interest in serendipity, and the problems inherent in trying to study it. Erdelez claims her research participants were very familiar with the notion that she termed accidental information acquisition, and had little trouble recalling these experiences. She cites four important elements for studying IE:

1. the information user
2. the environment
3. the characteristics of the information encountered
4. the characteristics of the information need

Throughout her study, Erdelez (1999) distinguishes between four types of information users, based on the frequency with which they experience IE:

1. non-encounterers (difficulty recalling IE experience)
2. occasional encounterers (sometimes have IE experiences, but put them down to luck)
3. encounterers (have IE experiences often, but do not link them to their information behaviour)
4. super-encounterers (count on IE experiences as part of their research methodology)

Erdelez (1999) notes the importance of being in the right mood to have an IE experience, and that some environments (libraries, bookstores, the internet) are more conducive to IE than others. However, these environments, she claims, are likely to be more useful to one

type of information-encounterer than to others. For example, Erdelez (1999) claims that super-encounterers might be more likely to use print sources than web based sources when seeking information, as the web would be likely to overload their information processing capabilities.

The IE incident, Erdelez (1999) notes, happens within other information behaviour, such as browsing or searching, and, although not new, is deserving of more attention from information scholars. She closes by noting that there may be ways of helping non-encounterers to see information as super-encounterers do, and that additional tools should be created to help with this.

Foster and Ford (2003) focus on a group of interdisciplinary scholars and their experiences with serendipity in their research. Their methodology included both purposive and snowball sampling to obtain interviews with interdisciplinary scholars. They applied grounded theory to the interview transcripts and found that the code for serendipity had to be broken down into multiple tenets. The first two of these focused on the impact that the found information had on the researcher: "(1) by reinforcing or strengthening the researcher's existing problem conception or solution; or (2) by taking the researcher in a new direction, in which the problem conception or solution is re-configured in some way" (p. 330). This finding stands out from other theories of serendipity as it allows for the advancement of the researchers' existing problem to be included under the serendipity rubric.

Perhaps the most significant finding of Foster and Ford's (2003) research was that the authors believed that serendipity could be obtained in two different ways, by "the unexpected finding of information the existence and/or location of which was unexpected, rather than the value" or "the unexpected finding of information that also proved to be of unexpected value: (a) by looking in "likely" sources; (b) by chance." (p. 332). For these authors, then, distraction from the information task at-hand was not a necessary part of the serendipitous process. In the letter coining the term serendipity, Walpole originally added the point that "no discovery of a thing you are looking for comes under this description" (Merton, 2004, p. 2). However, Foster and Ford include the

intended information being found in an *unexpected* place under the term serendipity. This dual definition has perhaps led to further confusion; some scholars might categorize finding information in an unexpected place to be co-incidence, rather than serendipity. Still, by putting this position forward, the authors advance the study of this difficult concept.

Five years after her publication on information encountering, Erdelez (2004) conducted another study of information behavior, in which she created a controlled environment for participants by reverse engineering an Information Encountering (IE) episode. She then had individual participants perform a search with a foreground problem, in order to see if they would 'serendipitously' find the information that aided them with a background problem that was common to the group.

Erdelez (2004) met her research objective (to identify the functional elements of an IE episode evoked in a controlled research environment) by asking each participant to complete a short survey, a search task, and then an exit survey about the process. It was found that 9 of the 10 participants noticed the IE trigger that was intentionally placed in the search. Of these nine respondents, not one stopped what he or she were doing to pursue the link, or to write it down for future use. Two participants noted that they had thought about doing so, and four of them noted confusion over the purpose of the study.

As a framework for this research, Erdelez (2004) uses the 5-step model that she first introduced in 2000: Noticing, Stopping, Examining, Capturing, and Returning. This study showed that, although people may notice IE triggers, they do not always allow themselves to be distracted from the task at hand. The study did not manage to track all five steps of the IE framework, and the author notes the many challenges that the controlled environment created for this type of research. However, the attempt at modeling IE and testing the model's validity was an important step in moving towards a methodology for studying serendipity.

Rubin, Burkell, and Quan-Haase (2011) created a new model of serendipity after conducting grounded theory research on blogs. The authors used Google Blog Search to selectively mine the results of publicly available blogs with 44 queries that were created

to retrieve the instance of a chance encounter. The researchers reviewed the first hundred results and noted those that fulfilled the following criteria:

1. Had to include a clear mention of an accidental find.
2. Had to be rich in nature, offering detail about the context of the find.
3. Had to be described in light of a fortuitous outcome.

Analysis of the blogs returned a total of 56 accounts of serendipity as defined by the authors. The authors then analyzed these accounts via grounded theory, applying three types of coding (open, axial, and selective) that led to the results: a set of emergent categories or 'facets' of serendipity. The seven facets of serendipity that they outline are:

1. Prepared mind
2. Prior concern
3. Previous experience or expertise
4. Act of noticing
5. Fortuitous outcome
6. The find [and]
7. Surprise

The model provided by these Rubin et al. (2011) is unique in that it shows that serendipity is no longer simply a linear process, but is one that requires certain elements to come together to create a fortuitous outcome. The element of prepared mind was further broken down by the authors into "a prior concern" or "previous experience or expertise" with the topic on which the find is focused. It was determined that simply being aware of a problem, instead of being an expert in the area, was often enough for one's mind to be prepared to reflect on the chance encounter. The authors note that this might differ from the scientific notion of serendipity, where expertise is needed to discover new finds, and this difference could perhaps be extended to include other scholars as well. Humanities scholars, for example, need to have wide background knowledge in their area before they can discover nuances in their research that might be classified as serendipitous finds. The model by Rubin et al., and the facets that the authors describe in detail, is useful for future research into serendipity, how it works in

online environments, and the comparison of everyday search behavior with the more directed search habits of scholars.

In order to examine the serendipitous encounter in a new light, Makri and Blandford (2012) interviewed 28 (mainly interdisciplinary) researchers, and had them undergo a critical incident component, in which they were asked to think about a specific serendipitous encounter, and then relay it back to them in detail by answering a number of questions about it. The interviews were then coded and analyzed using a grounded theory approach.

Learning from the previous models of serendipity they include in their literature review, Makri and Blandford (2012) state that they wanted a model for serendipity that is not focused on events, but rather on "mental connections" (p. 4). Their model, then, focuses on the connections that one makes to a piece of information, but only sees the process as leading to serendipity once the connection has been exploited, and the individual has had time to reflect on the value of the connection. The main difference between this and the other models is that there are two methods of reflection: the first reflects on the value of the outcome of the connection made in the first step of the model, and the second reflects on the unexpectedness of the circumstances OR the role of insight into making that connection. Makri and Blandford (2012) claim that the experience can only be considered serendipity if both of these reflections occur (p. 7).

In the discussion of each of the steps in their model, Makri and Blandford (2012) define what it means for an outcome to be "valuable" as one of four things: knowledge enhancing, impactful, timely, or time-saving (p. 10). Here, the authors only provide one example of each of these benefits of serendipity. It would be advantageous to see these categories applied more widely, or to see a similar study done which compares new findings to these in order to test their validity.

Finally, the authors use three examples from their interviews to show how their model properly demonstrates the mental connection between ideas and the positive outcomes and reflections that take place during a serendipitous experience. They conclude by noting that their model provides the "process and essence", or a "recipe" for serendipity

(p. 16). While the model does indeed include a number of traits necessary for serendipity at the academic level, it would need to be applied to a wider population to see if there are simpler or more complicated aspects of serendipity that take place in everyday information behavior.

Three recent works provide further discussion on experiences of serendipity in the digital environment. Two of these stem from McCay-Peet's (2013) doctoral thesis. The first article, co-authored with Toms, consolidates and critiques the former models of serendipity to show how the process of serendipity may unfold (McCay-Peet & Toms, 2015). Interviews with 12 participants were used to test the consolidated model, which includes five elements (Trigger, Connection, Follow up, Valuable outcome, and Unexpected thread) that come together to create a Perception of Serendipity. The authors then examined the internal and external factors that could influence each of these five elements of serendipity. Based on the findings from their study, McCay-Peet and Toms (2015) provide the following definition of serendipity:

"An unexpected experience prompted by an individual's valuable interaction with ideas, information, objects, or phenomena" (p.12)

Using this definition, McCay-Peet, Toms, and Kelloway (2015) report on a survey created to analyze human characteristics that influence, and characteristics of information environments that encourage, serendipity. This study had 289 participants, 52% of which were given a survey about a digital environment in which they find specific information, and 48% of which were given a survey about a digital environment where they find unexpected information. Previously created and tested questionnaires of Serendipity in the Digital Environment (SDE) (McCay-Peet, 2013) were used to identify both characteristics of the individuals that influenced the serendipitous experience, and aspects of the digital environments that facilitate serendipity. This study confirmed that three of the five facets identified in the study by McCay-Peet and Toms (2015) (Trigger, Connection, and Unexpected thread) have the potential to support serendipity in the digital environment.

In both the conclusion to McCay-Peet's (2013) thesis and in the following article with Toms and Kelloway (2015), the authors note that the SDE questionnaires require further testing in order to know whether they are valid measurements for serendipitous discovery. As an attempt to extend her findings, these questionnaires will be integrated into the survey instrument given to historians for Articles Two and Three of this thesis.

1.1.2   The Information Practices of Historians

Like all groups of scholars, historians have their own unique research behavior and information seeking habits, which have been the focus of many articles within the LIS community. This section will outline the findings from these studies, highlighting historians' growing use of technology, outlining changes to their the historical research process and showcasing their reliance on browsing and serendipity throughout their work.

1.1.2.1   The Use of Technology by Historians

After obtaining a number of critical incident reports from 53 academic historians, Uva (1977) confirmed 5 stages of their research process: problem selection, detailed planning, data collection, analysis and interpretation, and writing/re-writing. Throughout his study, it was found that primary materials are the single most important historical source throughout each of these stages, a finding that is supported throughout later literature (Case, 1991; W. Duff, Craig, & Cherry, 2004; Nygren, 2014).[3] Four years after Uva's study, Stieg (1981) showed that historians were prone to using print materials, both in terms of their sources (books, articles) and the finding aids they used to locate these documents (abstracts, indexes). Hers was one of the first articles that noted "the lack of use of newer forms of media by historians" as "striking" (p. 551). Here, Stieg (1981) was talking about pictures, films, videotape, computer printouts, and microfilm, the precursors to current web technologies. However, this image of historians as being wary of technology find its way into much of the contemporary literature on historians, and humanities scholars in general (Stone, 1982).

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[3] In historical research, primary documents are original documents, including contemporary accounts of the period under study. Secondary documents are those that describe or interpret primary documents.

Case (1991) studied the behaviour of 20 American historians through a combination of interviews and an analysis of their published articles and monographs. He noted their extensive use of the archives and the library, and that as early as 1988, 17 of the 20 total participants were actively using computers in their research, contrary to the work of Steig (1981) and Stone (1982). Delgadillo and Lynch (1999) also explored how historians seek information through interviews with 15 graduate students at UCLA. They found that history scholars held the library in great esteem, found it useful to have a good relationship with their subject specialist librarian, and had a positive attitude towards technology. Their participants mainly used computers for online searching, word processing and email. In 2004, Stieg (now Stieg Dalton) and Charnigo revisited the questions asked of historians in the 1981 paper, and found that, although print continued to be the main format of their material, these scholars were now much more open to other sources both physical (images, photographs, museum pieces) and digital (websites) (Dalton & Charnigo, 2004). These findings suggest that the reluctance of history scholars to use technology is a myth, and shows that over two decades ago historians were already starting to integrate computers into their work for word processing, database applications, and statistical analysis.

More recent articles shed light on historians' use of technology. A 2012 report from ITHAKA S+R shows that librarians and other research support professionals need to adapt their products and knowledge in order to meet the changing needs of historians (Rutner & Schonfeld, 2012). Interviews with 39 practicing historians showed that: primary sources were still of utmost importance to historians, the availability of digitized sources (primary and secondary) is an important change for historians, and that the open web has become the primary search tool for historians looking for archival collections or library resources. It is important, then, to understand what these changes mean for historians. Nygren (2014) has shown that use of the digital archive versus the physical can have an effect on history students' writing, with those who used the former tending to take a quantitative approach, and those who used the latter tending to include their own theoretical perspective. Solberg (2012) calls for historians to be "alert and active users and shapers of technology" in order to understand how these digital environments mediate historical research (p. 55). Before we can investigate how historical research has

been influenced by technology, however, we must first lay the groundwork by examining an information behavior common amongst historians: browsing. The following section outlines how LIS scholars understand the historical research process to date, highlighting the important role that both of browsing and serendipity play in this process.

1.1.2.2   Browsing and Serendipity during Historical Research

The LIS community's interest in historians might stem from their unique research behaviour. Case (1991) notes that, though there are several stages that a historian may go through during the research process (reading, condensing, collecting, assimilating, transforming, and synthesizing), these stages are rarely linear, and each may be revisited several times prior to the completion of research on a particular topic. This means that the amassing of information can take place at multiple times throughout a historian's research, and that their interactions with research material (and ability to make connections within this body of information) change repeatedly from when they first conceive of a research topic to when they sit down to write. Throughout these stages, though, one element of their research appears to remain important: browsing.

Delgadillo and Lynch (1999) confirmed the importance of browsing to the historical process. There was much talk of browsing throughout their interviews with history students, who were often instructed to browse their local library collections as part of their assignments. The authors note the importance of the chance encounter with material, showing that ten of the 15 students described relying on "the element of serendipity when browsing" (Delgadillo & Lynch, 1999, p.253). Several historians have written on the ways that their work has been affected by browsing and having a chance encounter with material (Hoeflich, 2007; McClellan III, 2005). Hoeflich (2007) compares historians to "ancient mariners", who "set out upon uncharted paths in libraries and archives, never really knowing what [they] will find" (p. 213). For Hoeflich (2007), the original two part definition of serendipity (accident and ability) was missing a third part: opportunity. In taking the reader with him on two personal tales of serendipitous information finding, Hoeflich details the benefits of the "all inclusive" archive, the choices that archivists have to make that will affect the history of the future, and the negative consequences of reproduction of original documents. He also notes the importance of the tactile aspects of

archival documents, and that significant qualities of historical artifacts can be lost when reproduced into a different medium.

The importance of browsing and serendipity to historical research was underscored again in 2008 in collection of essays titled *Beyond the Archives: Research as a Lived Process* (Kirsch & Rohan, 2008). Throughout this collection of personal accounts from historians, serendipity and connection building plays an important role. The editors note that:

"These authors illustrate the mostly undocumented phenomenon that a commitment to a research subject might begin with a simple clue. Authors show how they moved from a hunch, a chance encounter, or a newly discovered family artifact to scholarly research." *(p. 4)*

Each of these historian's serendipity stories shows a different experience of serendipity, but one that was familiar enough to unite these scholars' stories. The majority of scholars in this collection speak of the physical material that they work with, and where these serendipitous finds were made.

As previously noted, the shift to digital collections and web history means a change for historians, and most likely a change in the way that serendipity is experienced. This literature review has documented previous studies on the research habits of historians that draw attention to their reliance on browsing for research material. However, there has not yet been a study that looks directly at their understandings of the serendipitous discovery throughout the research process. This thesis aims to fill this gap. The following section outlines the intentions and organizational framework for the study.

1.2   Statement of Intent

This thesis stems from a desire to understand the role that serendipity plays in the historical research process in the current age of digital information environments, social media, and the Internet. By examining the definitions and descriptions of serendipity that historians provide, and analyzing their experiences in both digital and physical information environments, this work will bring together and continue two main bodies of work:

1. The role of serendipity in research, and
2. The information practices of historians,

Although both of these topics have been addressed in previous literature, this is the first study to bring together these topics for an in-depth, multi-method analysis of serendipity in historical research. At a time when historians are growing aware of various digital tools, it is imperative that there is a proper understanding of the changing nature of historical research, in order for their research needs to be met throughout academia and beyond.

In order to examine the role of serendipity in the research process of historians, a mixed methods study was conducted. The following three articles are the results of this investigation:

Article One presents the findings of a series of interviews with 20 historians on the topic of e-books, digital information seeking, and serendipity. This study provides an entry point for the discussions of digital historical work that are taken up in Articles Two and Three.

Article Two investigates the way in which historians define and experience serendipity during their research. Expanding on the findings of Article 1, this paper presents a multi-method analysis of answers to an online survey. Grounded Theory, Content Analysis, and Narrative Analysis are all employed to understand the experience of serendipity in historians' own words.

Article Three looks specifically at the various digital environments that historians use to encourage serendipity in their research. Martin and Quan-Haase (2013) surmise that, if digital tools could replicate the serendipitous experience with physical material that is experienced in a library, the historians that are reluctant to use digital materials might be more inclined to experiment with them. This article assesses the use of digital environments by historians, the frequency with which serendipity is experienced in both in digital and physical environments, and the features of digital environments that historians suggest support serendipity in their research.

The three papers outlined above form a thesis that, as a whole, works to fill a gap in the knowledge about one specific group of scholars, historians, as they alter and expand their methodological toolset. The experience of serendipity, so central to their research, will be the focal point. The next three sections will outline the surrounding literature and the methodologies employed in each of the three articles.

1.3 Article One: Looking "in the Right Places": Historians' Experiences with Serendipity

Serendipity is an area of great interest when it comes to research regarding academic libraries, whether they are physical or digital. However, as the literature in this field shows, there has been no attempt at comparing the experience that users feel in both types of these libraries (Warwick, Terras, Galina, Huntington, & Pappa, 2008), and no specific study which has historians as the participants (Anderson, 2010). This article addresses these research gaps, and provides a starting point for librarians and LIS scholars to recognize the importance of serendipity when thinking about one group of their primary users – historians.

1.3.1 Literature Review

Much has been made of the serendipitous experience since digitization of texts has become widespread and keyword search has been integrated into online systems. Early on, Weintraub (1980) questioned how digitization would change the research process of humanists, noting their love of texts and need for primary documents might make this transition difficult. Weintraub (1980) writes:

"From a humanist's point of view, the transition made in the fourth century A.D. from the text scroll to the codex form of the book was momentous and intensely desirable. One wonders whether a twentieth-century transition from the codex to the electronic text would be as welcome" (p. 26).

Thirty-five years later, his question remains largely unanswered.

Toms and O'Brien (2008) note that the humanist's search for texts, particularly for secondary sources, is now primarily done online, either through a general search engine

or via a library website. In order to improve the virtual library experience for these scholars, it is first necessary to understand what it is about the physical library that makes it so ideal a setting for serendipity and whether past and current digital libraries are meeting the same expectations. Elaine Toms (1999, 2000) has been investigating the concept of serendipity in libraries for well over a decade.

Investigating a digital environment, Toms' (2000) study consisted of 47 readers looking at a digital newspaper. She gave some of the participants instructions to browse, and others a specific goal of locating information. The screen that the participants were presented with had three areas: one main reading screen with the articles (one by one), one screen which offered a search bar, and one which presented a list of suggestions similar to the article being read. Many of the participants, who were from all walks of life, stated that the various encounters with information were rewarding: those with the browsing task generally seemed to take a less predictable path than those given an objective. Toms (2000) concludes that digital libraries would benefit from the stimulation of curiosity and the encouragement of exploration. They would also benefit from more user friendly, easily understood links. Toms suggests further research and encourages the implementation of information systems that take a 'fuzzy' approach to problem solving (providing links to further information, rather than a single, direct answer).

Toms and McCay-Peet (2009) conducted another user-focused study of serendipity. Keeping in mind previous studies by Erdelez (2000, 2004), the authors set out to discover how a suggestion system works in the context of browsing for pre-defined answers to tasks. In order to simply observe the task, and exert less control over their participants, the authors studied individuals that were part of a larger research project. Using WikiSearch, Toms and McCay-Peet (2009) created a Suggested Pages Tool based on a search on the first paragraph of the page that the user was on, minus the top entry (which would obviously be that same page). Each of the 96 participants was asked to perform 12 tasks, in a lab, followed by a post-task questionnaire. The quantitative data were taken from the log files of the tool, while the data from the closed questions were analyzed using SPSS, and the open-ended answers were manually coded and analyzed. Toms and McCay-Peet (2009) found that 40% of the participants used the Suggested Pages tool,

though not all of the users found the tool helpful. The pages did serve to 'trigger' the users' focus away from the task at hand, but participants did not always see this as a value. The authors suggest that the loss of control that the participants felt when moving away from their set task might have created the negative feeling of distraction. These negative feelings linked to distraction might very well have been more positive if the participants were asked to browse for information rather than given a set task. In their discussion, Toms and McCay-Peet note that more research needs to be done on which individuals would intentionally follow links to suggested pages, and how to facilitate this in information systems. Two questions are left for future research: What makes for the best triggering device in search systems? And, what is the best time to introduce these triggers?

Another study that looks at the role of serendipity in the library focuses on the resource discovery tools that are already available in academic libraries. Race (2012) introduces the notion of serendipity, an "accident that creates an opportunity", and its importance to scholars at different phases of their research. In this chapter, Race sets out to test four resource discovery tools (OCLC WorldCat local, Summon, ExLibris, and EBSCO) for different factors (derived from a lengthy literature review) that supports serendipitous search. Race notes the importance of personalizing the search process, and spends some time showing that interactivity between the user and the computer system is likely to help users better realize interconnections. The main strength in Race's (2012) article lies in her summary of web-scale discovery tool features that support serendipity. Here Race manages to break down the various tenets of serendipity (browsability, hypertext links, visualization of results, etc) and determine whether each of the aforementioned tools supports these features.

Race (2012) concludes that the four tools she examined all support serendipitous search to some extent, but that the 'single search box' offered by these tools might be working against them. A redesign of this feature (which, for Race, may resemble a short answer test) might provide a better starting point for those at the beginning of their academic careers. Finally, Race notes the need for visualization, which three of the four tools she investigates are lacking; to help users more readily establish connections between

materials. The criteria used by Race for understanding and evaluating these discovery systems are useful, and need to be kept in mind for future studies of library serendipity.

McCay-Peet's (2013) doctoral thesis found that serendipitous environments are those that are: 1) trigger-rich, 2) enable connections, and 3) lead to the unexpected. The type of digital environment (e.g., database, social media site) may also influence how frequently users perceive they experience serendipity in that environment. These findings are necessary to keep in mind when investigating historian's understandings of serendipity, in order to see if these subsections of scholars and professionals studied by McCay-Peet have varying expectations of their research environments. Several articles that have originated from McCay-Peet's (2013) doctoral work will be discussed at later points in the present thesis.

1.3.2   Research Questions

1) How do historians describe serendipitous experiences?
2) Does the physical environment of the library facilitate the serendipitous encounter?
3) What digital, heuristic forms of serendipity are being used or encouraged by historians?

1.3.3   Methodology

Data for this study were gathered through a series of interviews lasting about 30 to 60 minutes and conducted with 10 professors and 10 graduate students in the history departments of institutions of higher education in Southwestern Ontario from October 2010 to April 2013. Keeping the time frame of data collection in mind is important because every year e-books relevant to history are becoming more readily available, so the findings document the state of affairs at a specific time in the adoption of this technology. Respondents participated in semi-structured interviews, recorded on digital recording devices and later transcribed for coding. As these interviews were an extension of an earlier study (see Martin & Quan-Haase, 2013), the original ethics protocol was extended and posters sent out to history departments as well as emails to department chairs for distribution to faculty email lists.

The first 10 interviews were analyzed and coded using grounded theory and two major themes emerged: 1) descriptions of serendipitous experiences, and 2) a concern on the part of the participants that serendipity was no longer a part of the search process. Once the concept of serendipity emerged, questions were added to the interview guide in order to stimulate discussion on this topic, and to explore the phenomenon of serendipity in more detail. The interview questions were intentionally left open-ended so that participants could describe their research experiences in their own terms. The interviews remained semi-structured so that the researchers were able to probe further into answers that opened unexpected avenues for discussion (Berg, 2007). Interviews were structured as a conversation and the guide was followed only loosely to guarantee that all topics of relevance were covered. These interviews were then transcribed and coded using the same set of serendipity codes as the first 10 interviews. At the preliminary stage, two phases of coding were completed: the first is "an initial phase involving naming each word, line, or segment of data" and the second is "a focused, selective phase that uses the most significant or frequent initial codes to sort, synthesize, integrate and organize large amounts of data" (Charmaz, 2006, p. 46). Saturation was reached after analyzing the 20 interviews. Saturation in qualitative research is reached when no additional insights are gained from further analysis of the data (Corbin & Strauss, 2008).

1.4   Article Two: "You Don't Notice What You Aren't Looking For": Serendipity in the Historical Research Process

The previous article focused on historians and their use of the library and archive, with specific questions about the electronic book, the browsing experience, and what occurs when research material is moved online, replacing or supplementing a physical collection. One limitation of the previous article was the low number of participants – it took over two years to recruit 20 historians to take part in an interview regarding their research habits. With this in mind, a survey on Historians and Serendipity was developed in the hopes of recruiting a larger population of historians, and learning more about their experiences of serendipity during research.

Today's historians have many choices regarding their sources, methods, tools, and communication patterns. The interviews in Article One demonstrated the wide array of digital tools available to these scholars, and also highlighted some reasons that historians were wary of employing them. Although not all historians choose to make use of digital sources, there are many that reap the benefits of convenience, time saving, access, and knowledge sharing throughout their daily research activities. By looking to the LIS scholars that have previously investigated the research process of humanist scholars (Ellis, 1993; Meho & Tibbo, 2003; Wilson, 2007), the current article is an investigation into how, when, and where serendipity is experienced by historians in both the physical and digital information environments. As we wanted to know as much as possible about serendipity from the point of view of our participants, we decided to incorporate a number of open-ended questions in the survey. It is these questions that are the focus of the present article.

1.4.1   Theoretical Framework

Ellis' (1993) six-step model for the information-seeking patterns of academic researchers will provide the main framework for this study. From his work with social scientists, Ellis determined the following activities, which can take place at various times during the research process: starting, chaining, browsing, differentiating, monitoring, and extracting. His findings from other groups of academics also fell along these lines, with some incorporating an extra step, and some having fewer (Ellis, 1993). Ellis' model remains one of the most tested information seeking models in LIS literature, and many of the studies that use this as a framework are investigating the research habits of humanities researchers (Buchanan, Cunningham, Blandford, Rimmer, & Warwick, 2005; Ge, 2010; Meho & Tibbo, 2003). As the majority of Ellis' studies were done before many scholars made good use of digital technology and the Internet, some studies have been done that indicate the ways that these tools have impacted the original models. For example, Meho and Tibbo (2003) studied social scientists and found that there were four more stages in their information seeking: accessing, networking, verifying, and information managing. Lonnqvist (2007) expanded on Ellis' work by looking at different types of humanities scholars (archaeologists, art historians, philosophers, etc) and grouped their information

seeking habits into various typologies. Tom Wilson has done several studies that extend and comment on Ellis's framework as the basis for examining the information behavior of scholars. Though he notes that the six activities that Ellis lists in his framework appear to be linear (Wilson, 1999), Ellis never presented them in the same modeled fashion as Wilson, and they will therefore be used in this study as a non-linear framework to inform the coding process.

Ellis' model has widely been used to explore large segments of the academic population. However, there is no study to date that uses it to explore a single field, much less a small population within that field. By exploring the information seeking habits of digital historians, this research will test how well the characteristics of Ellis' (1993) model, combined with the more recent findings of Meho and Tibbo (2003) (Figure 3), describe the work of these scholars.
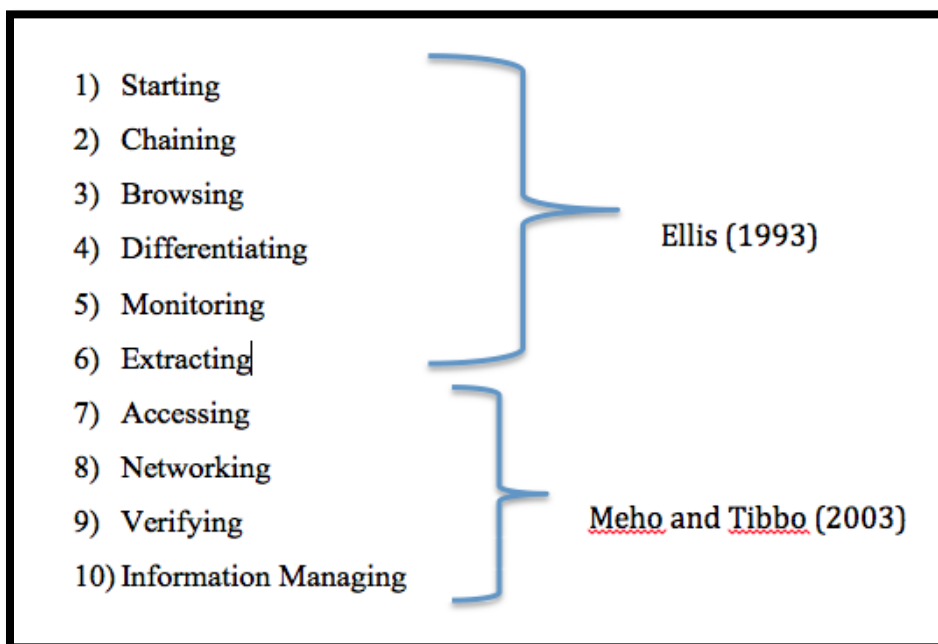
Figure 3 Combined Models of Information Seeking Habits of Academic Researchers

(Ellis, 1993, and Meho and Tibbo, 2003)

1.4.2　Research Questions

Several over-arching questions are addressed in this multi-method study. The aim is to expand on the findings of Article 1, and to provide a guide for examining the digital tools that will be the basis for Article 3. In order to do this, this article will focus on examining historians' understanding and experience of serendipity. The main research questions are as follows:

1) How do historians define serendipity in their own words?
2) At what point(s) in the research process do historians most commonly experiences serendipity?
3) Do the stories recounting serendipity in the historical research process reflect the definitions provided as answers to RQ1?

1.4.3　Methodology

This study consists of a multi-method analysis of the answers from an online survey. The purpose of the online survey is to gain a first hand understanding of how digital historians conceive of the notion of serendipity, and how it is experienced throughout their research process. The survey (See Appendix B) consists of both qualitative, open-ended questions and a series of shorter questions around online serendipity and tool use to gain quantitative insight into these aspects of their research behaviour.

The online survey was developed using Qualtrics, an online data collection system available at The University of Western Ontario. There were four sections to the survey. Section B contains the questions that inform this paper. It consisted of three open-ended questions:

1) Please enter a definition of serendipity (as it pertains to historical research) in your own words.
2) Describe the stages of research during which you most commonly experience serendipity.
3) Can you provide details about a recent serendipitous experience involving your research?

The answers to these questions were coded and analyzed in order to answer the individual research questions above (Section 1.4.2) and also helped participants to think through their own experiences of serendipity prior to answering the second section of the survey, the answers to which inform Article Three. The responses to each of the survey questions were analyzed using a different method. The definitions of serendipity (RQ1) were derived from a grounded theory analysis, the stages of research (RQ2) identified during a content analysis, and the details surrounding the participants' serendipity stories (RQ3) were analyzed according to the narrative analysis technique. This allowed for a break down of the serendipity stories into segments and determine which elements of these stories agreed with the definitions of serendipity determined by the historians' answers to RQ1.

1.5 Article Three: "A Process of Controlled Serendipity": An Exploratory Study of Historians' Experiences of Serendipity in Digital Environments

Expanding the findings of the previous two articles, Article Three investigates the features of digital tools that historians feel support serendipity in their research. Using both the findings from the survey in Article Two and the interview data in Article One as background material, this study provides an in-depth examination of the digital environments that historians are using to facilitate serendipity in their research. The resulting list of recommendations will assist librarians, LIS scholars, and historians themselves in understanding how these scholars are making connections that result in positive outcomes at various points in their research process.

1.5.1 Randomness versus Serendipity

One motivation for the development of tools aimed at enhancing serendipity in digital environments comes from the need to redesign and recreate the complexity of the research environment found in library stacks and archival collections. It is often argued that this complexity may be lost in digital environments, which are highly predictable and primarily based on keyword search (Martin & Quan-Haase, 2013). The extent to which

serendipity is altered in digital search is debatable. Nonetheless, this perception of loss directly affects how scholars, and in particular humanities scholars, adopt and use digital tools. Martin and Quan-Haase (2013) found that historians are skeptical of conducting their research exclusively in digital environments because they lack the ability to encounter key resources (primary and secondary materials) that could have a major impact on their research findings. In this study, the authors also found that historians were willing to experiment with digital tools, if these could recreate opportunities for "accidentally" encountering information. Hence, scholars perceive the discovery of resources, browsing, and chance encountering as central elements of their research practice that can, and need to, be supported online.

Outside of academia, a number of tools have emerged that try to introduce serendipity into the online experience. What is less clear from the literature is how to best support this process, as a wide range of approaches have been suggested ranging from interactions in social media (Bogers & Björneborn, 2013), exploration in non-search related digital environments (Rubin et al., 2011), and information search in digital environments (Makri, Bhuiya, Carthy, & Owusu-Bonsu, 2015). The approach most commonly taken is to introduce serendipity into the online information-seeking experience; this is often done by introducing some element of randomness to the search algorithm and thereby reducing the predictability of search results. An example of this approach is BananaSlug, which returns random results to a search query. Other approaches include reversing or modifying the ranking in which search results are presented online (e.g., Jansen, Spink, & Saracevic, 2000). This would draw attention to a different set of items because users commonly tend to investigate only the first and perhaps second pages of search results. All of these approaches aim at "broadening the search space, promoting encounters with items that might not, under existing algorithms, be identified" by the user (Burkell, Quan-Haase, & Rubin, 2012). While the majority of digital tools aimed at supporting serendipity have emerged outside of the humanities, a series of tools have recently been developed with humanists in mind (CHMN, 2013; Sherratt, 2013). These tools have garnered considerable attention in the field, but it remains unclear which elements of serendipity they support. Part of the problem is that the concept of serendipity is elusive (Merton, 2004) and it experiences are difficult to

pinpoint. Reducing serendipity to the introduction of randomness, however, does not seem to be the most productive way to move forward, though it is the one most commonly utilized. A second problem, and perhaps more concerning, is that scholars need to first understand that serendipity is not a one-dimensional concept but, rather, includes a number of related facets, all of which need to inform tool design and implementation.

1.5.2   Research Questions

The following research questions are answered through an analysis of the survey results and an investigation into the tools that historians are using throughout their research.

1. How comfortable are historians in digital environments and what digital environments are historians using to encourage serendipity in their research?
2. How often do historians claim to experience serendipity in these digital environments?
3. Which features of these digital environments do historians feel support serendipity?

1.5.3   Methodology

Section C of the survey on Historians and Serendipity, which looks specifically at serendipity in digital environments, will be used to answer the RQs above. This survey data aids in the examination of the features of specific digital environments that align with the serendipitous experience in the historical research process.

The online survey was developed using Qualtrics, an online data collection system available at The University of Western Ontario. Section C consisted of a series of questions about the location, frequency, and timing of serendipitous experiences within the research process. This section provides both quantitative data from Likert scale questions regarding the frequency of serendipitous experiences, and qualitative data where the participants are asked to recall and describe their experiences within digital information environments. See Appendix B for the full survey.

To determine the frequency and specificity of serendipity within these digital environments, this study will incorporate McCay-Peet's (2013) questionnaires for the Direct Measure of Serendipity in Digital Environments. These serendipity questionnaires have been analyzed and tested in multiple studies, and will be a good measure for historians' experiences of serendipity (McCay-Peet, 2013b).

Questions in this section included:

Q1.   Please list up to 3 digital environments where you have experienced serendipity.

Q2.   Questionnaire for the Direct Measure of Serendipity in a Specific Digital Environment

Q3.   Can you describe the features of this specific digital environment that you find to be most conducive to the serendipitous encounter?

Q4.   Questionnaire for the Direct Measure of Serendipity in Digital Environments

Q5.   Can you describe the features of digital environments that you find to be most conducive to the serendipitous encounter?

Q6.   Questionnaire for the Direct Measure of Serendipity in General

The first questionnaire asked about the historians' experiences of serendipity in the specific digital environment that they selected as their first choice in Q1. The historians were asked to describe the features of this tool that they found supported serendipity, before going on to answer the same set of questions about digital environments in general (Figure 4). To gauge what their experiences with serendipity are outside of the digital environment, we also asked these historians to answer the questionnaire when thinking about their experiences in serendipity in general. The quantitative answers provided by these questionnaires are supplemented with the qualitative descriptions of the features they find support serendipity, which were coded and sorted into categories defined by the type of digital environment they described.

In digital environments, I experience serendipity that has an impact on my everyday life.

1 2 3 4 5

Not at all ○ ○ ○ ○ ○ Completely

In digital environments, I experience serendipity that has an impact on my work.

1 2 3 4 5

Not at all ○ ○ ○ ○ ○ Completely

I encounters useful information, ideas, or resources that I am not looking for when I use digital environments.

1 2 3 4 5

Not at all ○ ○ ○ ○ ○ Completely

In digital environments I experience mixes of unexpectedness and insight that lead to valuable, unanticipated outcomes.

1 2 3 4 5

Not at all ○ ○ ○ ○ ○ Completely

Figure 4 Questionnaire for the Direct Measure of Serendipity in Digital Environments

(McCay-Peet, 2013)

1.6   Role of the Researcher

As cited in Creswell (1994), "[q]ualitative research is interpretative research" (p. 147). Though this thesis utilizes both qualitative and quantitative methods, I feel it is necessary to reflect on my role as researcher. For this reason, I wish to provide some feedback on my own experiences, both as a historian, and with serendipity, so readers understand my own interpretations with the thesis material. This brief section describes when I first started training as a historian, my shift to library and information studies, and the way that digital tools have changed my own experiences with serendipity.

When I started a double major in English and History at the University of Windsor, I did so for two reasons. The first reason: a faculty advisor told me I would not be able to handle it, that I did not have what it took to do a double major in four years. The second reason: I LOVED the library. I loved being surrounded by books and journals, finding my own corner of the big 1970s concrete monolith and hiding away, writing and reading

under a dimly lit fluorescent bulb. I loved that I could be in public, but felt alone amongst my sources, free to dip in and out of book after book, making notes, writing essays, and generally enjoying being a student.

It was not until an encounter in my second year Elizabethan history course that I realized that not everyone used the library the same way. A summer course with a well renowned professor, Dr. Bill Acres, gathered students from departments that might not have enrolled in a history course during the regular academic year. A number of those were students from science departments, trying to get the arts credit they needed to graduate. Waiting in line to talk to Dr. Bill Acres after class one day, I overheard him having a discussion with one of these science undergraduates, who was complaining that he could not find any sources on his chosen topic using the online Leddy Library catalog. Having spoken to this student several times after class, I felt within my place to interrupt, as Dr. Acres seemed to be enjoying letting this student pose the question, but was offering no real solution. "Why", I asked, "Are you using the online catalog? There are hundreds of books and articles written on Elizabethan history, even entire journals are devoted to this subject!" (I was, and still am, a devoted fan of Tudor and Stuart History). "Just go to the stacks - just find one book in the catalog and then sit on the floor going through everything in that area looking for more information."

The science student looked at me like I was a complete fool. Turned out he had never set foot in the physical library, much less would he sit on the floor poring over print. Dr. Acres interjected kindly, just as I was letting this all sink in. Kim's right, he said, go to the stacks, browse through the journals, come back next week if you still think there is no information on your topic in the library.

I will never know what happened with this student's search, though I like to think he fell passionately in love with the library and changed to a history major! I do, however, remember this as the first time I actually thought about my information behaviour (though I never would have called it that at the time). I recall asking all my friends in the sciences if they used the library, and most of them laughing at me. There were a couple

of science majors that I knew worked in the library often, but it turned out this was only for the quiet atmosphere, not for the wealth of material that lined the shelves.

As I continued on my academic path, I completed a MA in history and took several historiography courses. Here, I found my library loving peers. We would work amongst the stacks at various libraries. Some of us collected piles of notes about the information we found in different libraries and archives. Others collected books. My one colleague had roughly 250 library books in his living room before writing up his Master's thesis, each of them decorated with pencil marks and sticky notes. Personally, I was a note-taker. Having a fairly good memory for where I had found material meant that I could jot down a quick note in my writing about where citations might be found and make my way back to them via my notepad when I needed verification. But the writing was never the long part for me - it was always getting to the point where I felt I was ready to write. This meant scouring the stacks for hours finding every piece of information on my topic (at that time, the Gender of London in the Lord Mayor's Day pageants under Elizabeth and James I). I felt a desperate need to read all of the citations by all of the authors I respected. Any scholar knows that this is not possible, nor really necessary, but it was a challenge I felt I needed to complete to feel that I knew enough about my subject to write on it.

And then, there were those 'a-ha' moments when everything I had read came together. When I found the instances on an old map that the City of London was referred to as female. When another historian commented on the gendering of European cities as a side note, and changed the direction of my research, giving it new meaning. When I found maps with London represented as both a King and a Queen, but under the opposite gender's rule. These moments of insight, these serendipitous experiences were when my mind could suddenly see where my story was going. That was the excitement of history.

Life takes strange turns, and it was during my first attempt as a PhD student at the University of Warwick that my goals of being a historian were taken off track. I found myself pregnant with my son, and returned home to Canada, leaving academia behind for a few years, to raise him where I had been raised: in Southern Ontario. Some

investigation showed that Western University, this time in London, Ontario, offered a degree in Library and Information Science, which sounded very much like it would allow me to spend more time in the stacks which I had so loved during my undergraduate years. I applied, thinking I would study book history, or train to be an archivist. However, Anabel Quan-Haase, who would turn out to be my advisor on the present doctoral thesis, introduced me to the world of e-books in the second semester course on technology and society. I worked with Dr. Quan-Haase the following term to conduct a study on the use of e-books by historians (Martin & Quan-Haase, 2013), and it was during this time that serendipity reared its head again, though this time more directly: the historians I was interviewing repeatedly mentioned that the serendipitous experiences they were used to having in the library were not present during the online exploration of books and journals, at least, not in the way in which they were accustomed. This finding lead me to begin to question why this was so, to investigate serendipity as a concept, and to have the pleasure of working with historians and their stories as data that inform all of my studies in this thesis.

As this tale shows, my entry into the world of historians started long before my investigation of serendipity during their research process. My familiarity with the nature of historical research, the language with which they describe their work, the digital tools used in their research, and the networks in which they communicate certainly helped me gain entry to their world, and remain comfortable during the interviewing process. It may, indeed, have shaped my interpretation of the data I collected, but I have tried to remain open and inviting of new thoughts, theories, and histories of serendipity and historical research throughout my time as a doctoral student. It is my hope that the following statement of intent and the three papers that make up this thesis will demonstrate this openness and all I have learned upon the way.

1.7   Format of the Thesis

This thesis is written in the Integrated Article format. This format was chosen because I felt that my research questions, though related, were distinctive enough to constitute three separate pieces of writing. The themes of serendipity and historical research link each of the three papers, but each paper answers its own discernable research question that

contributes to the larger body of literature. This introduction and the concluding chapter will provide material that connects these three studies and presents findings of the overarching study.

1.8   Research Contributions

Understanding how the serendipitous experience occurs during historical research in today's digital landscape is vital for libraries, museums, and archives to continue to properly support these scholars. Historians, and more specifically the self-proclaimed digital historians, may continue to be one of the library's (whether physical or digital) most regular patrons, simply because of the nature of their research. It is therefore necessary for LIS professionals to understand their research behavior, their expectations of future library collections, and their experiences with digital research tools. This thesis will contribute to the existing research by providing the following:

1) For information professionals: a clear understanding of the nature of historical research in the digital information environment and how to best provide support.
2) For designers/programmers: a set of best practices for the creation of new tools for historical research.
3) For LIS scholars: a current understanding of the information practices of historians, in the context of the web and digital research
4) For historians: a deeper understanding of serendipity and how the digital environment is changing this experience.

While both the concept of serendipity and the research practices of historians are popular topics in LIS, there is no previous work that specifically investigates the concept of serendipity, as historians understand it. This is surprising, given that these scholars readily accept serendipity as part of the historical process and publish about the role that it plays in their research (Hoeflich, 2007; McClellan III, 2005).

The three articles described above constitute a comprehensive investigation of serendipity as it unfolds in the research process of the historian. The interviews conducted as the

research for Article One concerning physical and digital information environment laid the groundwork for further study by defining incidental serendipity and suggesting the role of agency in this experience. The survey developed for Articles Two and Three pressed questions about agency further, and examined how historians defined serendipity in their own words. Article Two focuses on the qualitative aspects of the survey, providing a multi-method analysis of definitions and serendipity stories. Article Three sheds light on the quantitative answers that historians provided about their serendipitous experiences in digital environments, showing how these information systems are supporting serendipity, although it is in different ways than it is supported in physical libraries and archives. There are several themes that run through all three articles:

1) Agency: both of the historian, and the object that is found during the experience of serendipity
2) The Environment: Digital and physical information environments have different factors that support serendipity
3) Serendipity as part of the research process: for historians, this experience occurs at particular points in their research, and is something that is actively pursued, if not expected.

Each of these themes, together with answers to the overarching research questions will be examined in detail in the final concluding chapter of this thesis.

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Article One

2 Looking "in the Right Places": Historians' Experiences with Serendipity

Historians, by training, are storytellers. They create narratives by integrating primary and secondary sources with their own research, to "give us insight not just into the particularities of historical experience, but also into the very meaning of the human" (Scott, 2011). By the time historians have created a narrative on a particular topic, they have connected many ideas along their path of research: choices have been made, discoveries have been found, and a collection of smaller, though no less interesting, stories have been woven into the fabric of historians' work.

Serendipity is a form of storytelling (Rubin et al., 2011). It is one with which historians are intimately familiar. Amongst the boxes of letters, photos, and old maps in the archive and along the carefully organized and browse-able stacks of the library these micro-stories play themselves out, accompanied by words like "A-ha!" and thoughts such as "found it!". Time and again historians reflect on their research process with fond memories of the instance that they made that all-important connection: the one for which only serendipity can be held responsible (Hoeflich, 2007; McClellan III, 2005). Retelling how they came upon a specific source or had an epiphany in the archives helps historians to link ideas not only for themselves, but also helps to convince their audience (whether it be friends, colleagues, or other readers) that the connection they have made is a useful one.

Developments in information environments have altered the way that many historians seek information, and how and where they read, write, and browse (Solberg, 2012). There are many tools available to historians that change how they acquire and access their research materials. Google is the "key player" amongst search engines for humanities scholars (Kemman, Kleppe, & Scagliola, 2013), library discovery tools strive to retain their importance through innovation (Race, 2012), and digital historians even design their

own toolkits (Graham, Milligan, & Weingart, 2014). Current studies of historical scholarship cannot ignore these changes.

Though shifting their research behaviour to a digital environment might create new opportunities for historians (Ramsay, 2014; Rosenzweig, 2001), it remains unclear how this will affect their experiences with serendipity. Serendipity has continually been connected to the physical information environment (Kirsch & Rohan, 2008; Rimmer, Warwick, Blandford, Gow, & Buchanan, 2008) and a move to the digital could jeopardize historians' encounters with this phenomenon. To counter this, attempts have been made to design tools that recreate elements of serendipity in the digital environment (Iaquinta et al., 2008; Rädle et al., 2012; Thudt et al., 2012), though none appear to have been implemented on a measureable scale . In addition, there is little evidence of these tools having been effectively used or evaluated (Quan-Haase & McCay-Peet, 2014).

This study seeks to understand serendipity as experienced by historians during their research process. It fills a void in the understanding of the challenges encountered in digital environments, and, at the same time, the opportunities they present. These digital environments might require historians to employ experimental forms of serendipity to recreate what they have experienced in physical environments.

Twenty historians in Southwestern Ontario were interviewed about their research process, and their experiences of serendipity in both physical and digital environments. The following three research questions are addressed:

1) How do historians describe serendipitous experiences?
2) Does the physical environment of the library facilitate the serendipitous encounter?
3) What digital, heuristic forms of serendipity are being used or encouraged by historians?

2.1 Literature Review

2.1.1 Historical research methods: Browsing and serendipity

The *Sage Encyclopedia of Quantitative Research Methods* outlines five steps in historical research (Lundy, 2008):

1) Identification of a research question
2) Developing a hypothesis
3) Data exploration and collection
4) Fact-checking and analysis of evidence
5) Writing the narrative

Though there are many variations on these stages, the move from the conception of a topic, to gathering information, to writing up the research in a formal document is widely accepted as the 'process' by which historians work (See Section 1.1.2 above for further discussion of these stages). It must be remembered that this process is far from linear: The beginning stages are repeated time and again until the historians feel they are ready to begin the writing process, and even then they may circle back to their sources for further scrutiny and fact-checking (Case, 1991).

The importance of the library to historians has been underscored repeatedly (Abbott, 2008; McClellan III, 2005; Stone, 1982; Woolwine, 2014). An examination of historiographical textbooks shows that Lundy's (2008) third step, data exploration and collection, is the stage where the library and archive are most commonly visited (Brundage, 2008; Cantor & Schneider, 1967). Proper library use comes up repeatedly amongst the skills suggested for historians in these texts. Interestingly, several of these textbooks devote space to training historians how to browse. Browsing has been linked to serendipity by several scholars (Foster & Ford, 2003; McKay, Smith, & Chang, 2014), with Rice, McCreadie, and Chang (2001) giving the name "serendipity browsing" to information seeking which is undirected and not goal-oriented (p. 171).

A textbook by Cantor and Schneider (1967) notes that browsing may seem an obvious aspect of working in a library, but nonetheless the authors continue to describe this experience to their reader:

Almost every college library has some areas of open shelves -- perhaps in the 'new acquisitions' section, in the reserve section, or even in the main collection -- and the student should make a point of spending some of his free time simply wandering around the stacks and looking at the books he finds. In particular, if the stacks for research sources are "open", the student should make a point of looking at the shelves all around the position of the particular book he is seeking, because books are catalogued by subject; and works related to the subject of any given book will be found by that book. By such general browsing, the student will find that he discovers many new sources, and in addition he will give a tremendous boost to his memory of these books if he opens and examines and glances through the contents of the volumes. Thus, book-browsing is not merely a form of idle curiosity, but is really a major aspect of the student's, and the scholar's, occupation. (p. 195)

In addition to encouraging history students to browse, Cantor and Schneider (1967) state that this browsing will provide a 'boost' of memory; a way for the historian to make connections between materials. Most interesting for the present study is that the authors name browsing the stacks as a 'major aspect' of historians' work. Instead of a simple act that appears as a byproduct of searching, browsing is a strategy that these scholars undertake during their research process. Several other scholars note the importance of this skill (Case, 1991; Delgadillo & Lynch, 1999). Brundage (2008) states that shelf browsing "entails simply looking at the volumes adjacent to those books you have gone to the stacks to fetch; some of your target book's neighbors are almost certain to prove valuable" (p. 42), again reiterating the value of browsing to the research process.

Studies of historians' information behavior have confirmed the importance of browsing to the historical process. Delgadillo and Lynch (1999) conducted interviews with history graduate students, which revealed that students were often instructed to browse their local library collections as part of their assignments. The authors note the importance of the

chance encounter with material, showing that ten of the students described relying on "the element of serendipity when browsing" (p. 253). Duff and Johnson (2002) looked at historians' use of archives, and found that their participants browsed, rummaged, or fumbled through material at the beginning stages of their research as a way of building contextual knowledge. Not only were the historians they interviewed interested in information directly associated with their topic, but "also in any information that tangentially threw light on it" (p. 487). This contextual knowledge, built up during the entire research process, is needed for historians to identify relevant material. Duff and Johnson (2002) argue that the 'a-ha' moments that historians often assign to serendipity, are less the results of a chance encounter than they are the products of "the deliberate tactics of the expert researcher" (p. 495).

Historians note that encountering a book, letter, or document in a physical environment is more useful than coming across it in a digital format. The historian Hoeflich (2007) details the benefits of the 'all inclusive' archive, integrating the physical and digital, and the negative consequences of digital reproduction of original documents. These consequences include a lack of experience with the tactile aspects of archival documents, and the loss of significant qualities of historical artifacts when they are reproduced in a different medium (Hoeflich, 2007).

The role of browsing and serendipity in historical research is underscored once more in a collection of essays titled *Beyond the archives: Research as a lived process* (Kirsch & Rohan, 2008). The editors note that:

These authors illustrate the mostly undocumented phenomenon that a commitment to a research subject might begin with a simple clue. Authors show how they moved from a hunch, a chance encounter, or a newly discovered family artifact to scholarly research (p. 4).

Each of these personal accounts shows a unique experience of serendipity in historical research, but one familiar enough to bring these scholars together to produce a book on the topic. Most of the scholars contributing to the collection recount their work in physical libraries and archives, and do not focus on digital collections. The shift to digital

collections and internet research means a change for historians, and likely also a change in the way that they experience serendipity.

2.1.2   Challenges in defining serendipity

The Oxford English Dictionary defines serendipity as "[t]he faculty of making happy and unexpected discoveries by accident. Also, the fact or an instance of such a discovery" (OED 2015). This definition is derived from the etymology of the word, which was coined by Horace Walpole (for details see: Merton and Barber, 2004; Rubin et al., 2011). Since its introduction into the English language, investigations of serendipity have defined the term in multiple ways, focusing on different aspects of the serendipitous experience. Van Andel (1994) has drawn together the largest "collection of serendipities", containing over 1000 instances of serendipity from the areas of science, art, technology, and daily life, and based on his comprehensive analysis, he proposed the following definition of serendipity: "[t]he art of making an unsought finding" (p. 631). This definition, however simple it seems, proved difficult to understand, even for van Andel, who later in the same paper questioned what it was he meant by both the term "finding" and "unsought" (p. 643).

More recent definitions of the term add to van Andel's definition the element of value, in that the found item is not just a surprise, but is of benefit to the individual who discovers it. For example, in a study of 14 creative professionals' self-reported strategies for increasing the chances of serendipity, Makri et al. (2014) claim that serendipity "occurs when unexpected circumstances and an insightful "aha" moment result in a valuable, unanticipated outcome" (p. 2179). This definition, derived from previous research two of the authors had done on the subject (Makri & Blandford, 2012a), introduces, perhaps unintentionally, the subjective nature of serendipity. Both the 'aha' moment, and the value of the find can only be truly considered serendipity by the person who makes the connection that determines the experience. However, it is not until McCay-Peet and Toms' (2015) most recent definition of serendipity as "[a]n unexpected experience prompted by an individual's valuable interaction with ideas, information, objects, or phenomena", that the role of the individual is more clearly articulated (p. 12). When

serendipity occurs, a connection between two ideas, thoughts, or concepts is made, and this happens within the mind of an individual.

One goal of this study is to examine how historians understand serendipity as it relates to their research. The present study has two important constraints that need to be taken into account. First, it is limited in its scope because it investigates serendipity as it occurs during the research process; the interview questions utilized in the study focused solely on serendipity as experienced while conducting research. Second, it is discipline-specific in that it focuses on historians and their research practices. While we are aware of the existing models and definitions of serendipity, we wanted to keep an open mind about the way that this population understood their serendipitous experiences. For this reason, we chose not to adhere to a single definition of serendipity at the outset of our research.

2.1.3   Serendipity in physical and digital environments

There are multiple environments in which historians work, including libraries, archives, catalogs, desktops, museums, and the Internet. In order to better understand the affordances of these various environments, it is useful to break them down into categories. One way in which these are often discussed is in terms of physical and digital information environments (McCay-Peet & Quan-Haase, 2014). This division allows researchers to understand the means by which scholars find, access, and interact with research materials. Many studies have used the division of physical and digital before, whether looking at tool use (Toms & O'Brien, 2008), qualities of humanities researchers (Rimmer et al., 2008), or their behavior in the library (Blandford, Rimmer, & Warwick, 2006). For the present study, we compare and contrast how historians experience serendipity in both physical and digital environments.

Physical environments are conducive to the serendipitous encounter (Björneborn, 2008; Erdelez, 1999; McKay et al., 2014). Humanities scholars themselves have written about their unique and research-altering finds in libraries and archives (Hoeflich, 2007; Kirsch & Rohan, 2008; McClellan III, 2005). What is it about the physical environment that encourages the chance encounter with information? The literature shows there are three

main factors: 1) the organizational structure imposed on material, 2) the users' comfort with the physical space, and 3) the users' ability to interact with physical texts.

Every time researchers enter the library stacks, they are working with a collection of materials that have been organized by librarians. Whether the classification system is Library of Congress, or the Dewey Decimal system, librarians have made numerous decisions about how to catalog library materials. One of the most important decisions in terms of facilitating serendipity is to organize these documents not by author or title first, but by subject (Liestman, 1992). It is these subject headings that allow for the stacks of a library to be conducive to experiencing a chance encounter with text, as users can scan for relevant material on the shelves in the areas surrounding the item they are seeking. This type of browsing, termed "serendipity or undirected browsing" (Carr, 2015; Rice et al., 2001) is one of the main ways that library users find information related to their subject that they did not know was there. As Liestman (1992) explains: "[c]oupled with open stacks, LC and Dewey provide access to a pre-arranged means for users to examine essentially any pertinent part of a collection with the reasonable expectation of serendipitous discovery" (p. 527).

The importance of browsing to the serendipitous experience is shown in two studies on the selection and borrowing of physical books (Hinze et al., 2012; McKay et al., 2014). The first study examines the borrowing rates of neighbouring books in a public library, using an OCLC data set to investigate if there was a 'neighbour effect' (i.e., books loaned on the same date as other books that were located within their 10 nearest neighbours). Though the study uses log analysis, and is therefore unable to confirm if the same individual was responsible for borrowing neighbouring books, it does confirm, and quantify, self-reports by users of academic libraries, who report that "visiting the shelves is a valuable experience" (McKay et al. 2014, p. 8). The second study by Hinze et al. (2012) investigates book selection behaviour in a physical academic library in order to inform the design of ebook collections in digital libraries. Through observation and interviews the authors found that co-located books play an important role in the shelf-scanning techniques employed by many of their participants.

The aim of the two studies by McKay et al. (2014) and Hinze et al. (2012) was not to look explicitly at serendipity in the stacks. Despite this, they both found that serendipity is a motivating factor for both public and academic library patrons who prefer to use the physical library shelves instead of their digital counterpart. As McKay et al. (2014) put it, browsing is important because "physical co-location creates context and allows information seekers to put themselves in the way of useful information" (p. 3). Other studies support the notion that the organization of the physical stacks facilitates serendipity, with Abbott (2008) showing the contribution made by librarians in the creation of the cataloging systems when he notes "[m]ost of this indexing and assembling is done by human minds, not by the concordance indexing that drives most of our current search engines" (p. 530).

While the subject headings imposed by librarians makes the browsing experience fruitful, there are other aspects of the physical library that facilitate serendipity. Björneborn (2008), investigating the serendipitous experiences of patrons in two public libraries, found that there were a number of physical dimensions that public libraries should support, including unhampered access to material, explorability of space which invites users to browse, and stopability, which invites users to stop, touch, and assess library materials. Björneborn (2008) studied the extrinsic elements of the library: the elements of place that were relevant to serendipity, not the elements of the user. Interestingly, Hinze et al. (2012) found that it was not the explorability or stopability of libraries that helped users to browse, but rather the constant nature of libraries. By being familiar with the physical library layout, which rarely changes, their participants were able to make a 'mental map' of the sections of the library they commonly use, and which they relied on when browsing for information (p. 311). Although both of these studies relied on interviews and observation, there are clear differences between answers when people are asked about which aspects of the library may facilitate serendipity versus how readers located and selected books to borrow. Continued research in this area may highlight the reason for these differences.

The third factor that helps to facilitate serendipity in the physical library is the user's ability to interact with texts. This works on two levels. First, book selection through

browsing is often done through aesthetic attributes of the books that might, at first, seem arbitrary. For example, colour, age, dust on the book, or images on the cover are all elements that factor into picking a book up off the shelf to find out more (Hinze et al., 2012; Thudt et al., 2012). In order for a serendipitous experience to take place, the user first has to notice the material that will enable her to make a connection (Rubin et al., 2011). In short, serendipity cannot happen without something catching the user's eye.

The second level on which interactions with texts facilitate serendipity is through the tactile nature of browsing. Flicking through pages, touching and holding materials is what Björneborn (2008) terms graspability and was described as a major affordance of the physical library by his participants. For historians, this tactile nature perhaps holds even more importance. Their work with primary documents is one factor that differentiates them from other humanities scholars (Case, 1986; Stone, 1982). Hoeflich (2007) notes that "the physical touch of documents is often an essential part of the inspiration that moves a researcher to make a serendipitous discovery—it connects the researcher in a very real way to the period under study" (p. 826)

Despite the familiarity and comfort with the physical library, present-day historians would be hard-pressed to work completely outside the digital information landscape. Studies that investigate the role of serendipity in the digital environment can be divided into two main areas: (1) the first examines the way that humanities scholars experience serendipity in order to inform the design of digital tools, and (2) the second investigates how digital tools facilitate serendipity.

Rimmer et al. (2008) interviewed 14 humanities scholars about their use of physical and digital research spaces, and found that several participants mentioned serendipity as being valuable. While this occurred most often in the physical environment, one participant noted a "different kind of serendipity" that they experienced on the web: where browsing through web pages caused one resource to lead to another, resulting in a find relevant to their research. For the other participants, however, the sheer quantity of information they encountered online was overwhelming. The authors concluded that "[n]ew means of

browsing in digital libraries could improve scholars' perceptions of serendipity when working with digital documents" (p. 1389).

Looking specifically at historians, Martin and Quan-Haase (2013) found that this population was hesitant to adopt ebooks because they found that their serendipitous experiences with digital information environments lacked when compared to the physical. McCay-Peet and Toms (2010) examined historians' physical experiences of serendipity in order to inform the design of digital environments. They found that there were two main elements of serendipity in physical environments: active learning and social networks. An analysis of previously recorded interviews with ten historians showed that serendipity often occurred during exploratory search, either when looking for research material or when talking to archivists or other scholars. They also concluded that it is necessary to consider an 'incubation period' in the experience of serendipity, as the historians' interviews showed that it often took time for some information to prove useful. This factor, they argue, is necessary to remember when designing digital environments with serendipity triggers.

Studies that investigate how digital tools facilitate serendipity include an examination of library discovery tools (Race, 2012), use of a mobile diary (Sun, Sharples, & Makri, 2011), and in-depth explorations of digital information environments (McCay-Peet & Toms, 2015). Looking specifically at resource discovery tools in academic libraries, Race (2012) introduces her notion of serendipity, an "accident that creates an opportunity", before outlining its importance to scholars at different phases of their research. She tests four resource discovery tools--OCLC WorldCat local, Summon, ExLibris, and EBSCO-- for different factors that support serendipitous search including browsability, hypertext links, and visualization of results. Race (2012) demonstrates the importance of personalizing the search process, and spends some time showing that interactivity between the user and the computer system is likely to help users better realize interconnections. Finally, Race (2012) demonstrates the need for visualization, which three of the four tools she investigates are lacking; to help users more readily establish connections between materials.

Enabling connections between materials has been identified as a central tenet of serendipity in several other studies. Sun et al. (2011), in a mobile-diary study of serendipitous experiences, found that an environment where people's minds were open to new information, where they are open to exploring, and to making connections between materials were all necessary elements for serendipity to occur.

Quan-Haase and McCay-Peet (2014) examine four different types of digital tools (social search tools, recommender systems, personal information management tools, and visualization tools) in order to determine how these tools support serendipity. They conclude that even tools designed for purposeful search (as opposed to browsing) can support serendipity, and the authors then provide guidelines for future tool design and evaluation methods for future studies.

For McCay-Peet and Toms (2015), enabling connections is one of four environmental factors that facilitates serendipity, together with being trigger-rich, highlighting these triggers, and enabling the capturing of information. In their most recent study, investigating the under-addressed role of the environment in facilitating serendipity, McCay-Peet, Toms, and Kelloway (2015) conclude that serendipitous environments are those that: 1) enable explorations, 2) are trigger-rich, 3) highlight triggers, 4) enable connections, and 5) lead to the unexpected. The type of digital environment (e.g., database, social media site) may also influence how frequently users experience serendipity in that environment. These findings are necessary to keep in mind when investigating historians' understandings of serendipity, in order to see how this population compares to the subsections of scholars and professionals previously studied.

2.2   Methods

Participants for this study included professors and graduate students in history departments of institutions of higher education in Southwestern Ontario. From October 2010 to April 2013, the authors conducted in-depth, semi-structured interviews that ranged from 30 to 60 minutes in length. The desire for in person interviews, and the need for travel for this to take place made it quite difficult to recruit participants. Emails to all academic departments of history in Southwestern Ontario only managed to reach a small

number of historians, and the final number of historians who participated in the study was 20. There were 11 faculty members and nine graduate students, with an even distribution of males and females. The data analysis followed a grounded theory approach through which insights are developed solely on the interview data. Although aware of previous definitions and models of serendipity prior to the coding process, we decided to reject the use of a theoretical framework in order to 'remain open' to the insights offered by the interview data (Corbin & Strauss, 2008).

Interviews were conducted in stages. In the first stage, 10 interviews were conducted and analyzed. The preliminary analysis suggested that historians often experience serendipity and are concerned about its loss as a result of the increasingly digital research environment. A second stage of data collection, consisting of 10 further interviews, was then conducted to corroborate the findings and expand upon these themes.

Once all 20 interviews were transcribed, the complete series of interviews was then coded in two phases. The first, "an initial phase involving naming each word, line, or segment of data", often referred to as in vivo coding, resulted in three main codes (Charmaz, 2006) (see Figure 5). We found that we had reached saturation for the themes Physical Searching and Accidental Information Acquisition after coding 15 interviews. Saturation in qualitative research is reached when no additional insights are gained from further coding of the data (Corbin & Strauss, 2008). Coding the remaining five interviews provided saturation for the third code: Heuristic Serendipity. Here, it became clear that several elements of their digital environment caused these participants to think of digital serendipity differently than their experiences in the physical library stacks.

Physical Setting	Digital Information Environments	Heuristic Serendipity
•go through •wade through •searching •looking •seeing •stumbles •scans •picking it up •flipping through	•stumble upon •inadvertant •discovery •all of a sudden •accident •serendipity •weren't looking for •drill through information •targeted •efficient •keyword •scroll	•play around •respond to •recommendation •browsing tool •order •teach •catalog

Figure 5 In vivo Coding of Keywords related to Serendipity in Historical Research

The second phase of coding consisted of "a focused, selective phase that uses the most significant or frequent initial codes to sort, synthesize, integrate and organize large amounts of data" (Charmaz, 2006, p. 46). This coding revealed a fourth theme, which we labeled Agency. Participants frequently used verbs to describe their research in the stacks, particularly in relation to their serendipitous experiences. Figure 5 shows the types of verbs that were used by the participants when describing their serendipitous experiences, and also highlights that different verbs are relevant for each of the three themes.

2.3   Results

Four main themes associated with serendipity emerged from the coding of the interviews. In response to RQ1 (How do historians describe serendipitous experiences in the library?), the primary finding introduces the concept of agency in historians' experiences of serendipity. The participants' descriptions of these interactions with research material led to a rethinking of the very definition of serendipity. The following two sections, *Importance of the physical library experience* and *Loss of context* outline themes that relate to RQ2 (Do the physical and digital environments of the library facilitate the serendipitous encounter?). The final section *Introducing new "heuristic" forms of*

serendipity responds directly to RQ3 (What digital, heuristic forms of serendipity are being used or encouraged by historians?).

2.3.1   Agency

As this study takes its understanding of serendipity from the perspective of historians who claim to have experienced this phenomenon during their research, we thought it necessary to reflect on the way that participants describe their experience. In the coding process, it became evident that many of the words used by historians to describe serendipity were verbs (See Figure 5). Of the 20 participants in the study, 17 historians used active verbs to describe their engagement with research material in the library or archive. Participant 20, for example, uses both the verbs "searching" and "use" to describe her actions during a serendipitous encounter:

The pro of physical searching is the serendipity of it, where you go to the book shelf and use the other books that you might not have thought of as being useful. (P20)

Participants also used words like "drilling", "looking", "wading", and "picking" in direct relation to a serendipitous occurrence. This realization prompted another analysis of the interviews in a new light, looking at the role of agency in the experience of serendipity. In addition to the active voice used by participants in describing serendipity, we found several specific examples that show historians as active agents in their browsing process, anticipating a serendipitous experience because they have created a situation where this is possible. Participant 14 displayed his knowledge of the library catalog and his method of working towards serendipity in the digital environment:

With the online stuff you have to be a little more active in your desire to be open to chance. Because everything gets categorized very nicely and neatly, so when you want to move sideways through material you have to make a conscious effort to do it. (P14)

Whether research was taking place in the digital or physical environment, it seems that the onus is on the historian to remain actively aware of where potential sources might be located and connections between materials can be made. Indeed, P11 linked serendipity

to simply "looking in the right places" in order to be actively aware of materials in one's research area, and noted that although e-books and digital libraries:

will obviously affect the process of serendipity, and maybe serendipity will take different forms, but serendipity itself will continue [...] when it comes to books, well I think the problem is that the authors are sometimes simply not aware of books that they ought to know about [...] you've got to be looking, and you've got to be looking in the right places. (P11).

As more and more information makes its way online and becomes widely available, being able to continue looking in all the right places becomes increasingly difficult. Historians will have to continue to make conscious efforts to actively seek information in ways that lead to serendipitous discovery. Only time will tell if serendipity is something that historians can anticipate when working in an online environment, or if the physical library stacks and archives will remain the primary space in which these connections are made.

2.3.2   Importance of the physical library experience

In the libraries and archives that our participants frequent, there were a number of different types of resources that were part of their serendipitous experiences. While browsing the bookshelves most commonly led to this type of encounter, historians also mentioned the smell of primary materials in the archives being an important part of their search process. The context of the specific journal article or newspaper story was also seen as necessary for serendipity to occur – without the surrounding and supporting material for these documents, it was more difficult for historians to make connections between these resources and their pre-existing knowledge of the topic.

When asked about the role of serendipity in their research, 15 of the 20 participants mentioned the stacks of the physical library or the shelves of an archive as the primary place where this experience occurred. Less an 'a-ha!' moment and more an intended side-effect of browsing, their experiences with serendipity occurred amongst organized

shelves, catalogued stacks, and piles of archival material. Participant 6 described how this experience was very contextual and based on interacting with the surroundings:

There is a serendipity to browsing the stacks, to being in the library and sort of seeing the book that's next to it and picking it up and something catches your eye, and everybody's had that. Everybody that's worked in a library has had that experience. (P6)

Six other participants described similar experiences when in the stacks. Whether the participants go to the library with the intent of searching for a specific book or simply to skim the shelves, they describe themselves as eagerly anticipating looking around in search of material that will help them with their research.

Interestingly, though the historians claim that the occurrences in the library stacks were serendipitous, the element of surprise that usually accompanies these experiences is not always included. Perhaps the only person to indicate a level of surprise was Participant 8, who described herself:

stumbling across something that's been shelved wrong or just stuck in the back of a library shelf. (P8)

Not only do the participants anticipate finding material that benefits their research, they knowingly go to the stacks because of the order inherent in this environment. As Participant 10 points out:

In the stacks you know there's an order to the books that are before and after, are usually somehow connected. (P10)

The connections suggested by the catalog system do indeed provide links between materials that might be different than the way that the historians themselves would think to organize their research.

The physical catalog itself was another reason that historians visited the physical library. Though being phased out and replaced by digital catalogs, two historians mentioned using this tool in their searching. Participant 17 states:

I do still see the value in actually physically going to the library, and being familiar with the stacks and being familiar with the catalog. (P17)

Whether searching, browsing, or a combination of both, our participants saw their use of the physical library as an important part of their research. This, however, did not mean that they were unaware of the benefits afforded to them by its digital counterpart. They continue to express concern over the way that browsing is executed in the digital environment.

2.3.3   Digital information environments

When asked about their opinions regarding the digital library and searching for e-books as opposed to their print counterparts, the primary concern was the inability of the keyword search to span outward and show related material, as Participant 7 explains:

You spot the article right next to it, or the article from a month before that your article is responding to, and you miss that with the e-searching, because it zeros in so tightly on what it is asked to find… it does find it, but the serendipity, you see? It's missing. (P7)

Despite the time saving and convenience of digital sources, half of the participants demonstrated anxiety over the limitations of this type of search, particularly in regard to the lack of opportunity for a chance encounter with material. They were largely concerned that the tools they are using to conduct these searches focus too narrowly on their search terms and thus eliminate the extraneous items that they often find while browsing. Participant 16, when asked about serendipity in the digital environment, stated:

in terms of actual chance encounters, you can get tunnel vision and sort of miss the surrounding material. (P16)

It is this surrounding material that is the key to serendipity in the physical library, and without it, as Participant 15 notes, historians:

have no, or very little access to, chance learning. (P15)

The same keyword searches that were deemed sufficient by historians, then, are only useful when efficiency comes before discovery. These tools would likely be used at a later stage of the research process, when fact checking and proof reading mean that citations need to be turned up quickly. When there is time to look around, the participants preferred the method that would turn up some information supplementary to their search.

The participants' concerns regarding digital tools are not only that they perform too targeted a search, but that they eliminate the context in which their sources exist. While it is convenient to know that a book or article is available, library web interfaces do not always tell you where the item is located, or supply other information necessary for historical research. Participant 7's concerns over journal articles demonstrates this:

And so when you search, you get what the search kicks up, and that just might be one or two articles from the same periodical, but you don't really have a sense of where they are in relation to other things. (P7)

This context appears central to the participants' browsing habits: if books are near each other on a library shelf, they are likely to contain related material, and therefore more likely to add a positive outcome to their work. In a digital catalog, Participant 18 states:

[Y]ou lack the sort of serendipitous finding of books on the shelf, and sort of the tangibility of just scrolling down the next few call numbers (P18).

Largely due to this lack of context in the digital information environment, these historians found that browsing related material online did not produce serendipitous results similar to those experienced when browsing in a physical information environment.

2.3.4   Introducing new "heuristic" forms of serendipity

In direct relation to RQ3 (What digital, heuristic forms of serendipity are being used or encouraged by historians?), several historians described their attempts to move their serendipitous experiences into the digital environment. We use the term "heuristic" here to describe the various methods that historians used to support elements of serendipity in digital environments. Despite the aforementioned anxieties over digital documents, over

half of the participants remained curious about e-books, digital libraries, and how technology could aid their teaching and research. Although they were unconvinced that the same sort of browsing and serendipity were likely to take place in the digital environment, 8 of the participants noted that they had experienced different types of chance encounters online. The structure of the web and way in which the network makes connections were of interest to Participant 18, who stated:

I think it offers a different serendipity, and so different abilities to sort of... you know, you search a term or whatever and random books are going to show up, but they might be more related to what your original search was. (P18)

Two tools that integrate elements of library serendipity are already popular with scholars, and were mentioned by five participants: Google Scholar and Google Books. Participant 8 spoke about the search engine in the same way that other participants described the physical stacks:

That's why I prefer Google Scholar because it's less specific and you always stumble across things that you wouldn't have come across. (P8)

This description of serendipity in the digital environment, particularly the phrase 'stumbling across' is similar to the way that historians describe this experience in the physical stacks. Three other participants noted the importance of Google Book search, one of them employing this same term:

Googlebooks, however, has just sort of come into my life. Because a Google search is, you know, you're looking for a subject and then books come up and you can stumble across them that way. I should add that I use Googlebooks much more than the official bought library books. (P13)

Besides using Google, three historians were incorporating elements of serendipity into their online search strategies by investigating some of the options available to them at their own institutional libraries. Participant 1 passes the techniques she has taught herself for incorporating serendipity on to her classes:

I always tell students that they can browse the catalog by the numbers, which is the equivalent of looking at the shelves, which comes as a real shock to them. The potential to do that is there (P1).

In addition to the various ways that participants were developing methods to re-create the serendipity they experience in the stacks, seven participants held out that elements of serendipity might be built back into these digital systems, whether via a recommendation system or a digital browsing tool. When asked what this might look like, most were unsure, but the two answers following hint at the elements of serendipity that most appeal to them:

One could imagine a really nice book interface which mirrors the stacks [...] if you are looking at a book on the screen you want it, that lets you know what the two books beside it on the shelf are, but it has to be ambient, can't just keep throwing more information on the screen because then it reduces the usability. (P6)

I guess I like the potential for e-books to be a sort of multi-dimensional resource and the idea that you could almost have a choose-your-own-adventure style link between ideas. (P18)

It is evident from the interviews conducted that serendipity plays a vital role in historical research. But what is it about the historical research process that makes the serendipitous experience so prominent for these scholars?

2.4   Discussion

2.4.1   Agency and incidental serendipity

The interviews with historians revealed that serendipity is not purely accidental in nature as past scholarship suggests. By means of their historical training, these scholars learn to use the library and archive environment to find the pieces of information that will help them build their story. Looking "in the right places", as Participant 11 mentioned, does not happen by chance, but because historians are taught how to search, browse, and discover in the information environments of the digital and physical library. The

historians' own descriptions of serendipity using the active voice, combined with their descriptions of browsing being almost verbatim the textbook instructions on how to browse for historical sources, shows that the experience of serendipity involves an element of intention. This finding extends Duff and Johnson's (2002) description of historians experiences with serendipity being influenced by the "deliberate tactics of the expert researcher" (p.495). The present study shows that the individual is playing a role not only in the storytelling or reflection aspect of serendipity, but that they are actively seeking these experiences and perhaps even anticipating them.

The "unexpected" nature of serendipity described in previous studies (Makri, Toms, McCay-Peet, & Blandford, 2011) is not supported by the interview data. Instead, there appears to be intention, and perhaps an expectation, behind both the act of browsing and the choice of where this browsing takes place. A recent definition of serendipity by McCay-Peet and Toms (2015) shows that serendipity does not have to be an unintentional process. She chose this definition because it "makes room for serendipity as an experience in which the *existence of intentionality does not rule out serendipity*" (McCay-Peet, 2013, p. 11, emphasis added). While this definition aligns more closely with the historians' experiences, it does not make room for the learned skills and behaviours that these scholars describe when they visit the library looking for information. These skills change serendipity from being decidedly accidental when experienced by other groups to something that is incidental when experienced by historians. Serendipity, for historians, happens as a consequence of proper historical training, years of working in the stacks, and past practice working with materials. Reframing serendipity to reflect the participants' experiences, then, would result in a definition that stresses the intentionality of the process.

The incidental discovery of valuable information related to historical research; often takes place in an organized information environment.

This definition allows for serendipitous discovery by historians to occur in both physical and digital information environments. We know from the interviews, however, that these two environments create different experiences for historians. Individual agency and

preference may also account for the varying uses of these environments and the likelihood to encounter serendipity.

2.4.2   Browsing and the physical library

The interviews conducted clearly show the importance of the physical library for historians. This supports much of what the past literature has found about their research habits (Abbott, 2008; McClellan III, 2005; Stone, 1982). What is remarkable is that these scholars are intentionally going to the stacks to experience a serendipitous encounter with research material. Obviously, not every trip to the library will result in this type of experience, but it seems, for these historians at least, that it occurs often enough for them to continue to return to the stacks anticipating that it will happen again.

Contrary to the observations by Carr (2015) and Liestman (1992), several of the historians interviewed here clearly understood not only the organizational system of the library, but also the benefits that this system has for serendipity. Many of the participants described how they looked for research material; by going in search of a specific work but knowing that they would be browsing around the selected item for further research material. The importance of physical searching even extended past browsing the stacks, as several participants noted the need to physically browse through the documents they took off the shelves in order to find relevant, if not necessarily serendipitous, reading material. Each of these acts of browsing reflects a choice that the historians made. In the stacks, their own personal agency, combined with learned research skills and a mind prepared with previously gathered information, helps them to experience incidental serendipity.

2.4.3   Searching and the digital environment

When searching online, historians had a difficult time placing their sources in context, which, for a researcher who is actively seeking serendipity in the physical environment, makes research much less fruitful. The narrow scope of the digital search results also limits the agency of these scholars, who are used to being able to make choices about what books they pick up when browsing and what chapters or articles they scan in those books. Instead of being able to browse at will, they have to choose from a list of results

from a targeted search; this list does not allow them to browse, explore, or discover new material in context, the way a physical library would.

The key finding regarding the digital information environment is that it is not serendipity that is missing, but rather the lack of means to create context for the material that is located using digital tools. Historians using the online environment did not seem to suffer the common problem of over-exposure to information, or the 'noise' of the web. Instead, they longed for the organization of the library to provide context for these digital materials. The digital search results only show what is directly linked to the search terms entered by the historian. Without knowing the other articles in an edition, stories surrounding a newspaper clipping, or the order in which a series of letters was written, these historical sources have no context. This results in two problems that limit the occurrences of serendipity: 1) finding tangentially linked material does not occur as frequently as it does in the stacks, and 2) historians are unable to make contextual connections to these sources that help them to integrate the sources into the story they are telling.

2.5   Conclusion

This study investigated historians' experiences with serendipity during the research process. Twenty historians in Southwestern Ontario were interviewed about the benefits and drawbacks of digital and physical environments, and their serendipitous experiences in both. Three main conclusions can be drawn.

First, the interviews demonstrate that agency plays a role in historians' serendipitous experiences. The impact of historical training, as evident from textbooks (Brundage, 2008; Cantor and Schneider, 1967) and supported in these interviews with historians is that these scholars actively browse material in hopes of finding relevant, useful information. This finding has implications for studying historians' information behavior, as it shows that there is an agency to their browsing behavior that makes serendipity something that is incidental to their information behavior, and not unanticipated or unexpected, as is customarily assumed (Makri and Blandford, 2012; McCay-Peet and Toms, 2015).

Second, it was found that historians prefer the physical environment to browse for research material, and the chance at a serendipitous encounter is a large reason for this. The participants have become accustomed to creating connections between material that they encounter in the physical information environment, and do not find that its digital counterpart allows for the same experience.

Third, digital information environments could be improved by supplying context for historians' sources, both primary and secondary. Both Woolwine (2014) and Duff and Johnson (2002) highlight the importance of context to the historical research process. The present study demonstrates the need for digital tools that allow historians to place their research materials within the context of surrounding historical literature, and within an organizational system that highlights links and connections to other similar material.

Historians' training, however haphazard it may have been framed in the past, follows a research process with several steps. Though these steps may not be linear, the end result of this process is a written narrative of the past. Historians' work is piecing together segments of information about the past in order to tell a story. Much of these segments will be found by looking in the right places, in a library or archive, and many of the connections they make throughout their research process will happen as they browse for material, whether online or in the physical stacks. It is no surprise, then, that serendipity occurs throughout their research. This incidental serendipity is a product of their information behavior and learned research skills. Their ability to connect material and create a narrative out of their own experiences benefits not only those who read their historical work, but also those who want to hear about the historical research process.

2.6   Future Work

Future work in this area could focus on exploring the connection between agency and serendipity. Once this is established, it would be useful to know if agency accounts for serendipitous connections that are made in digital environments the same way it does in the physical information environment. Future studies could also look at different groups of library users to see if their training increases their chances of serendipitous connections during the research process.

Article Two follows on from this work by discussing the findings of a survey created to understand Historians and Serendipity. The format of a survey was chosen in the hopes of gaining a wider population of historians than was willing to participate in the lengthy interviews for the present article. Further reflection on the how experiences of serendipity differ between the physical and digital environment, and more detailed work to create a definition of serendipity as it is experienced by historians is also discussed.

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Article Two

3   "You Don't Notice What You Aren't Looking For": Serendipity in the Historical Research Process

[T]here is an uncanny feeling of dizziness or frenziness when you feel you have prehended something in your 'data', which makes you forget your world and its concerns, whether around or far away from you.

(Tamboukou, 2015, p. 14, ft 16).

A recent paper by the historian Maria Tamboukou (2015) highlights the "uncanny feeling" that historians experience when the connections in their research material begin to make sense. This feeling has been described as serendipity by many historians, who claim that it has been sparked by things such as a particular piece of historical writing, or by speaking with or listening to colleagues (McClellan III, 2005; Nissenbaum, 1989). The serendipitous experience most commonly recounted by historians, however, occurs in the library or archive (Hoeflich, 2007; Kirsch & Rohan, 2008). Using several philosophical theories to critically analyze her own experiences in the archives, Tamboukou (2015) problematizes this common phenomenon, and seeks to answer the question "why has serendipity become a sine qua non of archival research?" (p.1). She takes issue with her fellow historians referring to this archival experience as serendipity, suggesting that there is something else at play in the historical research process which accounts for these sudden realizations. She describes serendipity as a 'refrain', and argues that this experience should be understood as a result of a process of understanding, and not as a result of a chance encounter:

This is of course not to deny the possibility of pure chance, which is always, already there; it is just that sometimes when you read accounts of archival research serendipity emerges as a refrain, a rhythmical repetition which emits signs that there must be something different, something more [or less] than pure chance.

(Tamboukou, 2015, p. 9)

For Radford, Radford, and Lingel (2015) it is the library that is prone to offering up chance encounters. Using Foucault's concept of 'heterotopia', these authors examined the expectations of patrons upon entering and using a library. For Foucault, a heterotopia was a place that allows for a "sort of mixed, joint experience" where one feels as if they are in two places, yet remain in the same physical location (Foucault & Miskowiec, 1986; Radford et al., 2015). While other studies have used this term to refer to archaeological landscapes (Samuels, 2010) or online communities (Harrison, 2009), and Foucault himself used the concept of a mirror to demonstrate his meaning, Radford et al. (2015) show that the library becomes a heterotopia, particularly when serendipity is concerned. They argue:

The delight in surprise points to a paradox of serendipity in the library – the deliberate arrangement of the library in ways that foster surprise, the distribution of assets in a ways that reveal multitudes of experiences. Serendipity is thus the mechanism through which heterotopia operates. (Radford et al., 2015, p. 744)

Whether in the library, the archive, or in a digital information environment, serendipity has become a much-debated topic, with many scholars intrigued by these hard-to-define experiences. For serendipity scholars, chance is only one element of serendipity, which is a complex phenomenon that also includes elements such as "a prepared mind", "noticing", "a fortuitous outcome" (Rubin et al., 2011), "making a new connection", and "reflection on the unexpectedness" (Makri & Blandford, 2012a), amongst others. Further difficulties in defining serendipity will be expanded on in Section 1.4 of the present article.

It has been shown that the environment in which one works is important to the experience of serendipity (McCay-Peet et al., 2015; Quan-Haase & McCay-Peet, 2014), and the two studies by Tamboukou (2015) and Radford et al. (2015) highlighted above support this position. However, by focusing solely on the environmental factors that support serendipity, the role of the individual in the experience of serendipity becomes lost. Serendipity is a retelling of past events, and therefore functions as a story in which an individual that experienced serendipity narrates their experience, either to themselves or

for others. Tamboukou (2015) demonstrates the importance of the individual when she examines her own experiences with serendipity; but this is only one historian's point of view. What is needed is a clearer understanding of how historians define, comprehend, and experience serendipity for themselves.

This paper will fill this gap by examining serendipity through the lens of historians: a group of scholars that make frequent use of both libraries and archives (Dalbello, 2003; Duff, Craig, & Cherry, 2004). Examining the responses to this studies' recent survey on serendipity and history, the following research questions are explored:

1. How do historians define serendipity in their own words?
2. At what point in the research process do historians most commonly experience serendipity?
3. Do the stories recounting serendipity in the historical research process reflect the definitions provided in RQ1?

3.1   Literature Review

3.1.1   The chance encounter in historical research

The Library and Information Science (LIS) community has long had an interest in the research practices of historians, and in the various stages that they go through as part of this research (Case, 1991; Dalton & Charnigo, 2004; Stieg, 1981; Uva, 1977). Though there are a number of models for the stages of historical research (Ellis, 1993; Meho & Tibbo, 2003), the simplest is perhaps that by Lundy (2008), which includes the five following stages:

1) Identification of a research question
2) Developing a hypothesis
3) Data exploration and collection
4) Fact-checking and analysis of evidence
5) Writing the narrative   (Lundy, 2008)

From the earliest in-depth look at historians' information practices, Uva (1977) shows that serendipity plays a role throughout these stages when he notes:

In drawing any conclusions of historians' stage behavior it is evident that a combination of channels were utilized in each phase. This is probably due to the nature of historical research, which can be easily categorized on paper, but proves rather serendipity in practice. (p. 26)

Though his phrasing of the term may seem a little odd, Uva (1977) was describing what other LIS scholars would later pick up on: historians' information behaviour is not a linear process. Historians have been found to move back and forth between stages of research until they feel they are prepared to write, leaving Case (1991) to proclaim these research stages altogether "illusory" (p. 78).

Whether they work in stages or not, the nature of historical work has been shown to be serendipitous by several LIS scholars (Stieg, 1981; Stone, 1982). In their report on a survey and citation analysis of historians' use of information sources, Dalton and Charnigo (2004) state that serendipity, "when the meaning of the word is extended beyond the dictionary's definition as the gift of finding something valuable that was not sought to include the finding of something not known, but hoped for, plays a significant role in historical research" (p. 410). Anderson (2010), goes a step further in his presentation of survey results with historians in the UK, and calls serendipity one of the "wide variety of information seeking methods" his participants employ (p.82).

To counter this view, two studies of historians argue that it is not serendipity that creates the opportunity for historical finds, but instead it is the meticulous methods of the historian (Case, 1991; Duff & Johnson, 2002). Case (1991), in his study of twenty historians, found them to be organized and methodical in their research habits, while Duff and Johnson (2002) argued that discovery in the historical research process was "influenced less by serendipity and more by the deliberate tactics of the expert researcher" (p. 495). So here we have a dilemma: either historians' information habits are haphazard, with a combination of information channels, sources, and approaches, or they are meticulously applied, well organized, and methodical. Either way, there is something

about the nature of the historian that causes them to attribute their important findings in a library or archive to the unexpected: and to retell these experiences as serendipity stories.

The term *serendipity stories* is employed here to refer to the stories in which historians recount their experiences in the library or archive, how a connection between ideas was achieved, or the way a lost document was discovered.[4] These tales are quite common amongst historians. Several examples from recent years include Nissenbaum's (1989) winding research path to the story behind the famous poem *The Night Before Christmas*, McClellan's (2005) interactions with accident and chance as he attempted to answer a fellow historian's question, or Hoeflich's (2007) serendipitous journey through a law library back into academe. The year 2008 saw a full collection of these stories in Kirsch and Rohan's *Beyond the Archives: Research as a Lived Process*. Though the editors set out to give the historians' game away by presenting personal tales of historical research, the theme of serendipity runs through each of the eighteen contributions. In their introduction, they argue that "the experiences narrated in this volume teach the importance of attending to facets of the research process that might easily be marginalized and rarely mentioned because they seem merely intuitive, coincidental, or serendipitous" (Kirsch & Rohan, 2008, p. 4). In their collection and elsewhere, however, it seems these stories *are* attended to and recalled in detail largely *because* of their serendipitous nature. As the stories in Kirsch and Rohan (2008) make clear, this fascination with serendipity goes further than the archive. Serendipity finds its way into historians' treks across university campuses (Kirsch, 2008), it creates interactions with notes left in finding aides (Rohan, 2008), and it even surfaces in graveyards (Stockton, 2008). It appears then, that serendipity is not only linked to library and archival research, but to historical research of any kind. Why do historians choose to remember and represent their research experiences through the lens of serendipity? Why not demonstrate the hard work they put into finding their sources, and highlight instead their own abilities of insight and observation?

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[4] The term "serendipity stories" was also used by Makri et al (2014; 2012b) to summarize their participants answers and aid in comparison between stories, not for the purposes of narrative analysis, as presented in the present article.

3.1.2   Agency and serendipity

In their thorough examination of serendipity, Merton and Barber (2004) note that Horace Walpole's original coinage of the term suggests that he was describing a "quality of mind" of the Princes of Serendip, rather than their full experience (p. 109).[5] Many different terms aiming to show the role of the individual as agent in the chance encounter have been created (Merton & Barber, 2004), such as serendipitist (Hotson, 1942), serendipper (Seymore, 2009), and encounterers and super-encounterers (Erdelez, 1999). But over time it is not the personal noun that has stuck, as the Merton and Barber (2004) point out:

If serendipity was originally coined to mean a quality of the actor in a happy accidental discovery, it has with use become coterminous with the whole event of accidental discovery, and even with the object of such a discovery. (p. 103)

Returning the individual to the center of a study of serendipity means reflecting on the role they play in this experience. Agency, or the "ability or capacity to act or exert power" (Oxford University Press, 2015) has previously been connected to serendipity (Bandura, 1998, 2006; Lieblich, Zilber, & Tuval-Mashiach, 2008). Bandura (2006) notes that "to be an agent is to influence intentionally one's functioning and life circumstances" (p. 164). One of the circumstances that he claims can be influenced by human agency is fortuity, which can be made more probable by moving in certain social circles, living an active lifestyle, and cultivating one's interests (Bandura, 1998, 2006). Bandura is not alone in these claims; LIS scholars have also shown that creative professionals have devised strategies to increase their chances of experiencing serendipity (Makri, Blandford, Woods, Sharples, & Maxwell, 2014). However, the role of the individual is less the focus in Makri et al. (2014) than is the need to support serendipity in the digital environment. For Bandura (2006), people who experience serendipity can exert their agency on the situation in two ways: 1) by acknowledging the situations in which these

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[5] For the full story on the coinage of the term see Merton and Barber, 2004.

experiences occur and working to place themselves in the path of chance, or 2) to recognize serendipity when it occurs and make the most of the opportunities it presents.

Bandura (2006) highlights four properties of human agency, which, when enacted, show that individuals are "contributors to their life circumstances, not just products of them" (p. 164). These are:

1. *Intentionality* - action plans and strategies for realizing them.
2. *Forethought* - setting goals and anticipation of likely outcomes of prospective actions to guide and motivate efforts.
3. *Self-reactiveness* - the ability to construct appropriate courses of action and to motivate and regulate their execution.
4. *Self-reflectiveness* - the capability to reflect upon oneself and the adequacy of one's thoughts and actions.

(Bandura, 2006)

Lieblich et al. (2008) have also explored the related concepts of agency and serendipity in narratives. They define a narrator with agency as "someone whose deeds, choices, and preferences have determined one's situation" (p. 613). They highlight the role of these agents in narratives of personal experiences, and compare the role of agency to that of structure (when the narrator presents their life as being controlled by external circumstances), communion (when the narrator suggests the influence of others in one's social network determines their own path), and serendipity (when the narrator attributes their life events to luck, or chance) (Lieblich et al., 2008). For these authors, serendipity does not constitute a lack of control over one's personal actions, but rather "as manifesting openness to experience: the ability to improvise and use so-called random events and choices made by others … for the benefit of the narrator" (p. 618).

How then, do historians view their own agency as playing a role in their serendipitous experiences? As scholars who have been trained to be methodical and meticulous in their research habits, do they recognize their own information behaviour as leading them towards to the more frequent possibility of serendipity? If this is the case, the definitions and serendipity stories of the participants presented in the present paper would reflect the

qualities of agency, as presented by Bandura (2006). The historian as agent would be seen as actively pursuing research, making choices and preferences that determine their own paths (Lieblich et al., 2008). Serendipity, then, as Anderson (2010) demonstrates, would be one of many information-seeking methods available to the historian. Careful analysis of the serendipity stories that historians relayed as answers to our survey on Historians and Serendipity will investigate if this is the case.

3.1.3   Definitions of serendipity

The challenges of defining serendipity have been remarked on by several authors (Makri & Blandford, 2012a; McBirnie, 2008). Makri and Blandford (2012) note that:

The slippery nature of the phenomenon poses a problem for research in the area; it makes serendipity difficult to study and it makes it difficult for researchers to make strong claims about the nature of the phenomenon because the goalposts are always moving; different people have different understandings of serendipity and these understandings are likely to change and perhaps evolve as they are challenged by new (and different) experiences. (p. 685)

We have discussed the challenges in defining serendipity in previous articles (Martin & Quan-Haase, under review) and agree with the above statement by Makri and Blandford. In our previous work, we suggested a definition of serendipity that resulted from a series of interviews we did with historians: "The incidental discovery of valuable information related to historical research; often takes place in an organized information environment" (Martin & Quan-Haase, under review).

In the creation of the above definition of serendipity, which we termed "incidental" because it occurred as part of historical research, not accidentally, historians were not asked directly to define the term. Thus, the definition was always considered a starting point for further research. As will be shown below, the purpose of this paper is not to use our understanding of serendipity as an entry point, but rather to invite historians to describe and define serendipity in their own words.

3.2   Research Design

3.2.1   The survey tool

The use of a survey instrument over other qualitative methods was decided upon for a number of reasons. Having previously conducted interviews with historians, we were aware of how difficult it was to gain participants (Martin & Quan-Haase, 2013). The time commitment of a full hour for an interview was difficult for historians to afford and we wanted to ensure a larger sample size to provide their reflections on serendipity in the research process. Thus, we decided on a survey that allowed them to commit 10 – 15 minutes of their time, at their own convenience. The survey instrument has four sections: Section A - participant research area, Section B - serendipitous experiences with research material, Section C - serendipitous experiences in the digital information environment, and Section D - demographics.

While most of the questions in the survey had a closed-ended format, with the choice of 'other' to provide alternative answers, the section that the current paper is concerned with (serendipitous experiences with research materials) included three open-ended questions, where the participants could write as little or as much as they wanted in their responses. Despite our awareness concerning issues of non-response to open-ended survey questions (Reja, Manfreda, Hlebec, & Vehovar, 2003), the choice to include questions was made in order to allow participants to define serendipity without being confined to a predetermined set of characteristics, and to allow them the space to provide details about a recent serendipitous experience.

3.2.2   Data collection

Data for this study were collected in a survey developed and distributed through Qualtrics at The University of Western Ontario. This system was chosen because Qualtrics is a secure means of collecting survey data, which does not rely on cloud-based computing for storage. We wanted to ensure a wide sample of historians, and thus did not define historian in any particular way. We also included history students as part of the intended sample (see Appendix E for the recruitment letter). After obtaining ethics consent (see Appendix C), participants were recruited online via social media (Facebook and Twitter)

through relevant listservs (Humanist and HNet) and through emails sent directly to history departments at universities across Canada. The survey was live from February to April 2015. Throughout this time, we checked in weekly to ensure the number of participants continued to grow, and that the answers to the survey were relevant.

Of the 142 participants who started the survey, 90 participants completed it in full. There could be several reasons for this: some of the questions regarding serendipity were open-ended in nature, and therefore took more time to answer than traditional survey questions (Reja et al., 2003). Also, none of the survey questions were mandatory, so the participants chose to answer the questions that were relevant to them. While this may have resulted in a loss of data for this study, we believe it was necessary in order to give participants control over which answers they chose to provide.

3.2.3   Demographics

The population of this survey identified as 55 % female and 42 % male, with 1% identifying themselves as 'other' and 2% preferring not to identify their gender. The ages of the population were as follows: 18–24 = 9%, 25–34 = 33%, 35–44 = 23%, 45–54 = 17%, 55–64 = 11%, and 7% of the population was 65 and older. Forty-nine per cent of historians who answered the survey had a PhD, while 36% had a Masters, and 9% an undergraduate degree. The participants were asked to select their area of history from an extensive list, and had the option to add their own topic if they deemed it more suitable. See Appendix F for full list of the areas of history studied by the participants.

While there was a wealth of information collected in the survey, this article is concerned primarily with the answers to the following open-ended questions, which map directly onto the three research questions for this study (Table 1).

Table 1 Research Questions mapped onto Questions from the Survey Instrument

Research Question	Question as it appeared on survey instrument
RQ1. How do historians define serendipity in their own words?	Q11. Please provide a definition of serendipity (as it pertains to / historical research) in your own words.

RQ2. At what point in the research process do historians most commonly experience serendipity?	Q13. Please describe where in the research process you most commonly experience serendipity.
RQ3. Do the stories recounting serendipity in the historical research process reflect the definitions provided in RQ1?	Q14. If possible, please describe a recent serendipitous experience that occurred during your research.

The number of participants for survey questions 11, 13, and 14 were 91, 91, and 60, respectively.

3.2.4   Multi-method analysis

Each of the three open-ended questions on the survey was created with the intention of directly answering one research question in this paper (See Table 1). We decided on a multi-method approach, and employed a different type of analysis (grounded theory, content analysis, and narrative analysis) for each set of answers. The next three sections outline each research question, the method of analysis employed, and present the findings.

3.3   In Their Own Words: Historians Define Serendipity

As there have been many attempts at defining serendipity in the LIS literature and beyond, we wanted to investigate how historians would describe this phenomenon in their own words. The question on the online survey was phrased as follows:

Q11: Please provide a definition of serendipity (as it pertains to historical research) in your own words.

3.3.1   Methods I

The 91 respondents that answered this question provided a wide range of definitions, with answers ranging from as short as five words to as long as three or four sentences. A grounded theory analysis was performed on the 91 answers as it can be applied to a variety of data collection methods (Charmaz, 2006) and it allowed us to develop insights directly from the survey data.

After familiarizing ourselves with the data we realized that the complexity of each definition made it impossible to comprehend or compare them in their entirety. We decided that it was best to unitize the definitions into in vivo codes because this style of coding is "taken from or derived directly from the language of the substantive field" (Strauss, 1987, p. 33). This allowed us to stay close to the words that historians used to define serendipity. We took the inductive approach of open-coding, with the intent of creating a series of categories derived from the data (Berg, 2005). The constant comparative method of analyzing and continuously sampling from the population, commonly employed in grounded theory (Glaser & Strauss, 1967) was not possible because we collected all of the survey answers at once. We decided therefore to code the answers 10 at a time, making memos along the way and reflecting on how the codes came to form the various categories. The first full coding of the answers resulted in 119 unique in vivo codes. Memoing throughout the coding process helped us to divide these codes into categories that described historians' Serendipity Components (hereafter SCs). We employ the term "serendipity components" throughout this study to describe the categories of in vivo codes, which were segments of the historians' original definitions. We found this to be a useful method of coding and comparing the words and phrases the historians employed. The initial analysis resulted in seven categories, as shown in Table 2.

Table 2 Historians' Serendipity Components (SCs) - First Coding

Category	Description	Examples
The 'Un'-factor	Words used by participants to indicate the unexpected interaction with research materials.	• unanticipated • unknown • overlooked
Active Research Methods	Verbs used to describe participants own behavior.	• browsing • reading • looking • finding
Descriptions of	Adjectives used to describe the material	• valuable • enlightening

the Find	that is encountered.	• pertinent
What the Find does	Descriptions of the material encountered having an effect on the participant.	• filling a gap • deepens understanding • sends in a new direction • answers a question
Connection	When the participant describes a link between material(s).	• correlation • combination • juxtaposition
Location of the Find	Descriptions of the environment in which the find occurs.	• shelf-browsing • Dewey • near known sources
The Eureka Moment	The moment when participant realizes the importance of find.	• sparks • starts to make sense • lightbulb

This analysis left us with some additional in vivo codes which were unaccounted for, but which we deemed important through our memoing process as they seemed to revolve around three additional categories: "the Digital", "Newness", and "People". This prompted us to do a second analysis of our categories, in order to confirm the original seven categories were appropriate, and to explore the other categories in detail.

Open coding continued through the second round of analysis, as well as axial coding, consisting of "intense analysis done around one category at a time", which was applied to each of the seven previously established categories (Strauss, 1987). The original seven categories were supported in this second analysis, but there was insufficient evidence for including the three secondary categories. We decided to include the in vivo codes for the Digital as a sub-category under the SC "Location of the Find". The number of in vivo codes around the categories of "People" and "Newness" were low in consideration of the other more prevalent categories (they occurred less than ten times). We made memos about these two categories, but in the end we decided to leave them out of the final analysis. A selective coding around each of the seven core categories was then done, resulting in 166 unique in vivo codes, and clear definitions for each category (Strauss,

1987). The complete set of in vivo codes, organized according to category, can be found in Appendix G.

3.4   Findings I

Figure 6 shows the distribution of the in vivo codes. The three SCs that are clearly most supported from the interview data are: "The 'Un'-factor", "Active Research Methods", and "Descriptions of the Find". Figure 7 shows the number of categories that each participant employed as part of their definition of serendipity. No historian mentioned only one SC as part of his or her definition. The majority of the historians mentioned 3 (31%) or 4 (39%) of the SCs in their definition, supporting previous findings that serendipity is a complex experience that cannot be boiled down to a single dimension (Makri & Blandford, 2012; McCay-Peet & Toms, 2015). The following sections provide further detail on the analysis of the individual SCs.
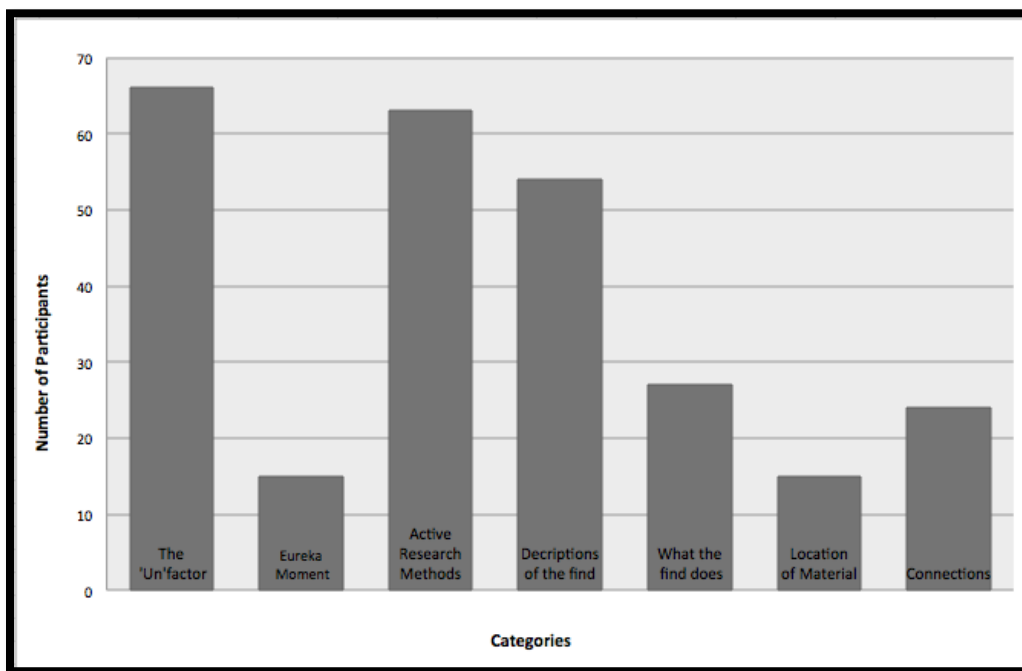
Figure 6 Distribution of SC use by All Participants (N=91)
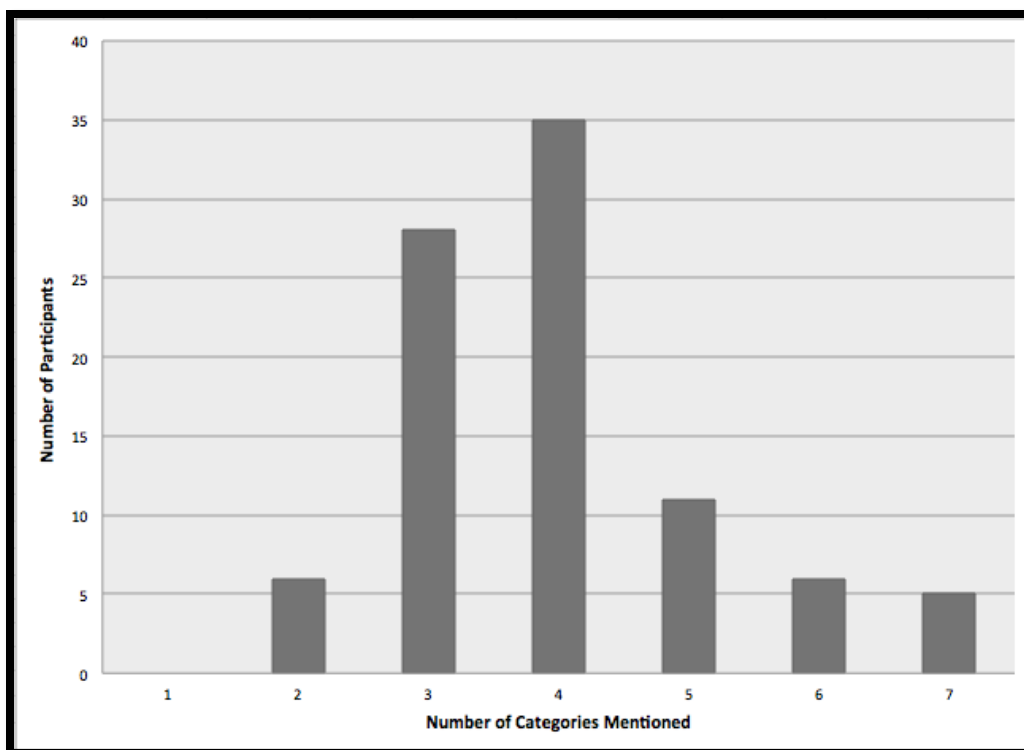
Figure 7 Number of SCs Mentioned by Participant (N=91)

3.4.1   The 'un'-factor

Since the original story by Horace Walpole in which the word serendipity was coined, there has been an element of the unexpected associated with this experience (McCay-Peet, 2013). It is therefore not surprising that 73% of the historians included words associated with the unexpected. Figure 8 shows the words that historians used to describe this type of encounter with research material. Having an unexpected encounter with research material is a commonplace way for historians to talk about this experience, whether it takes place in the archive or the library stacks.

Figure 8 The 'Un'-factor Word Cloud

(generated with Wordle www.wordle.net)

3.4.2　Active research methods

More intriguing are the words that historians used to describe their own behaviour when this experience occurs. Rather than using passive words that describe ways in which this experience happened, the historians used active verbs, showing that they play a role in the outcome of this experience. Words such as 'hunting', 'pursuing' and 'capturing' all portrayed the diligent historian, actively searching for material. Several historians also recognized themselves as being actively open to serendipity during the research process, and did their best to see that the 'unexpected' encounters with material did not pass them by. For example, one historian mentioned 'actively creating conditions in which chance encounters are likely to occur', while another described themselves as 'being open to being taken in new directions'.

3.4.3   Descriptions of the find

The find is the material that enabled the historians' serendipitous experiences. Often described as having a positive impact in general descriptions of serendipity, the historians specifically detailed how the find played a role in their research process. Whether it was filling a gap or being a key piece of a puzzle, the 'correctness' of the find was identified as being 'tailor made', 'exactly what I need', or 'perfect' by participants. While these descriptions are more difficult to connect with the unexpectedness that the historians included in their definitions, there were other adjectives, such as 'delightfully distracting' and 'enlightening' that showed how the find relates to historical research, but is not necessarily something without which their research would be incomplete.

3.4.4   What the find does

In addition to the descriptions of the find, 27 historians went on to further describe how the find impacted their work. These descriptions show that the find is, for these participants, something more than the physical or digital object. The connection between the information that the find contains and the historian's previous knowledge was shown to trigger a shift in thinking. This change in thinking was described in several ways, as 'opening a door', 'deepening understanding', or providing 'a conclusion never considered'. One word that came up repeatedly was 'new'. After experiencing serendipity, these participants felt that their research was changed in such a way that 'new roads', 'new directions' and 'new ideas' were the next steps. This shows what a powerful experience serendipity can be.

3.4.5   Connections

The 'pattern-seeking mind of the historian' (as described by Participant 72) has many different ways of connecting material. During their definitions of serendipity, many of these types of connections were exemplified. Described as 'juxtapositions', 'tangential', 'correlations', and 'combinations', there were multiple methods that the find was connected to material in the historian's mind. These descriptions all demonstrated that the

participants were actively working to understand relationships between the materials that they study, and how these connections are often found to be serendipitous in nature.

3.4.6   Location of the find

As has been pointed out in previous studies, when it comes to serendipity, the environment matters (McCay-Peet et al., 2015). The environments that were commonly mentioned in participants own definitions of serendipity are not unexpected: archives and libraries. These two information spaces were mentioned as both physical and digital locations. Curiously, the organizational structure of the library or archive that is commonly understood as a reason that serendipity 'works' in these spaces (Carr, 2015), was not the reason for several of these historians. Instead, they found items that were 'not properly indexed by historians', or were 'tucked away in a folder [they] shouldn't be in', more likely to lead them to serendipity.

3.4.7   Eureka moment

The 'a-ha' moment, when the participants understood the connection between the find and their prior knowledge, was included in the definitions of 15 of the participants. Most commonly referred to as a 'discovery', this moment was also termed 'a surprising revelation', or a 'happy occasion' by participants. They described it as the moment when everything 'starts to make sense', and 'becomes obvious', almost as if it is a time when their minds become clear in regards to the future of their research.

3.5   Serendipity in the historical research process

After asking the historians to define serendipity, we wanted to know more about these experiences. In particular, we wanted to know when during research this experience most commonly occurred. The second open-ended question concerning serendipity was phrased as follows:

Q13: Please describe where in the research process you most commonly experience serendipity. (ex. While searching for a research topic, while writing a paper, while presenting at conferences, etc)

3.5.1   Methods II

The initial analysis of this data set showed a discrepancy in the way that the historians interpreted this question; leading to both an intended and an unintended, but still useful, answer. The 'where' in the question led some participants to talk about the stage of the research process that serendipity most frequently occurred (the intended answer), but also led many participants to talk about the environment in which they experienced serendipity (the unintended answer). Of the 91 participants that answered this question 68 spoke about the stage or stages in their research process that serendipity most frequently occurred, and 58 spoke about the environment in which this experience happened. Thirty-five responses included elements of both of these perspectives. As both types of response are likely to impact the way that we understand serendipity in the historical research process, we decided to analyze the data for both interpretations of the question.

The answers to Q2 were therefore analyzed using directed content analysis, where the goal "is to validate or extend conceptually a theoretical framework or theory" (Hsieh & Shannon, 2005, p.1281). Sampling was done through the location of themes, or "a simple sentence, a string of words, with a subject and a predicate" (Berg, 2005, p. 273). A list of codes and definitions were developed using existing theories of a) historical research processes and b) environmental factors of serendipity. We developed operational definitions for each category and a final coding frame for each type of response (see Tables 3 and 4). To ensure the reliability of this coding frame, we sent both the data set and the coding frame to a second coder for a confirmatory analysis. An inter-coder reliability analysis was performed, using the Kappa statistic, and the inter-coder reliability was found to be Kappa = 0.82, or "almost perfect" (Landis & Koch, 1977). This high inter-coder reliability demonstrates the trustworthiness of our coding frame.

3.5.2   Methods - serendipity in the research process

Previous studies have indicated that knowing the different stages of research in which serendipity plays a role would be beneficial for the design of digital tools (McCay-Peet & Toms, 2010). This study is a first attempt at exploring serendipity's role in the various stages of the historical research process. While there are many models of information

seeking by LIS scholars (Ellis, 1993; Wilson, 1981, 2007), we decided during the creation of the survey to provide space to allow the historians to describe their behaviour in their own words, instead of having them check boxes that subscribe to a previous theory.

The 91 answers to this question were analyzed using a pre-existing framework for understanding the historical research process. The initial analysis employed a combination of models by Ellis (1993) and Meho and Tibbo (2003) (see Figure 3 in Introduction for details), which was chosen because together they reflect the physical and digital environments in which these historians work.

However, it was quickly apparent that the historians' descriptions of their research process did not easily map onto the stages that had been identified in the literature by Ellis (1993) and Meho and Tibbo (2003). The detail with which the LIS scholars assessed information behaviour was not described by the historians, who used more general terms like 'during research' to describe their experiences with serendipity. To counter this incongruency, we decided instead to use a five-part model of historical research (Lundy, 2008), which simplified the process and was more accurately reflected in the words used by the historians to describe their experiences. Table 3 below outlines these five stages, the number of historians that experienced serendipity in each stage, and includes a participant's quote to represent the way that this was expressed. The responses given by participants were not exclusive to a single category, as many historians recalled experiencing serendipity at multiple stages of research.

Table 3 Serendipity in the Historical Research Process

Stage of research (Lundy, 2008)	Number of participants that experienced serendipity during this stage	Participant's quote
Identification of a research question	6	"during the initial search phase, while reading widely" (P78)
Developing a hypothesis	5	"When formulating my argument around my research" (P16)
Data exploration and collection	62	"in the research stage: when the topic is identified, but sources remain uncertain and elusive." (P32)
Fact-checking and analysis of evidence	12	"the point somewhere between redrafting a paper and searching for new material to fill gaps in the research." (P43)
Writing the narrative	21	"While writing a paper, as the writing process engenders thinking." (P10)

3.5.3   Methods - serendipitous environments

As the descriptions of the environments in which the respondents experienced serendipity was an unintended finding of the survey, we did not have a model upon which to rely when coding these answers. Our familiarity with the literature on historians and serendipity allowed us to locate material which supports the importance of the following aspects of the environment: digital and physical information spaces, the role of social networks, and the uses of both primary and secondary sources by historians. We decided to identify these themes from the literature, and performed a second content analysis on the interviews based on the following five elements (See Table 4 below).

As previously noted, the importance of the environment to the serendipitous experience has been outlined in the literature (McCay-Peet & Toms, 2015; Quan-Haase & McCay-Peet, 2014). This is supported in the historians' descriptions of their work environments when asked where in the research process they experienced serendipity. The literature on this topic reveals that the digital and physical information environments offered different

types of serendipitous encounters (McCay-Peet & Toms, 2015; Quan-Haase & McCay-Peet, 2014), and that the social networks of the individual also play an important role in their experiences of serendipity (McCay-Peet & Toms, 2010).

Table 4 Environmental Factors of Serendipity in Historical Research.

Code	Identification in the literature	# of historians who mentioned environment	Quote
Physical Information Environments	Björneborn (2008); McKay, Smith, & Chang (2014)	36	"going through non-digital finding aids, such as card catalogues. This is usually where I find things that I could not find online, or was not expecting to find." (P62)
Digital Information Environments	McCay-Peet et al. (2015); Quan-Haase & McCay-Peet (2014)	17	"when clicking through web archives." (P18)
Social Networks	Dantonio, Makri, & Blandford (2012); McCay-Peet & Toms (2010)	20	"it is when I am interacting with others that I find serendipity most often." (P89)

3.6   Findings II

3.6.1   Serendipity in the research process

The participants did not commonly associate the beginning stages of the historical research process (Identification of a Research Problem and the Developing of a Hypothesis), with the experience of serendipity. There were a couple of historians (Participants 58 and 87) who 'stumbled' onto their research topic, but for the majority of the participants it was during the phase of Data Exploration and Collection that serendipitous connections were made. Sixty-two of the 91 participants associated this stage of their research with serendipity. Many of them described 'searching', 'looking', 'digging' and 'reading', and other terms that show the active nature of research during

this phase, which is commonly spent in libraries, archives, or making use of their digital counterparts.

The term 'research' was somewhat problematic, as it was used as a verb by 31 participants to answer the question 'Where in the research process did you most often experience serendipity'. Examples of this include 'archival research', 'while researching' or 'during research itself'. While some of these participants went on to describe other stages of the research process where they had experienced serendipity, these 31 responses demonstrated that the way that historians describe their own research process is much different from the way that LIS scholars might describe it, where stages such as verifying information, differentiating, monitoring, and networking might have come into play (Meho & Tibbo, 2003). These brief answers are also likely the result of a survey format, and would have been more easily expanded upon had the study taken the form of an interview or focus group. Further reflection on the discrepancies between LIS models of humanities information seeking and historians' own descriptions of their work will be provided in the discussion (Section 3.9).

Other participants took the time to describe their research, and were more specific about what they were doing when serendipity occurred. The active role that the historian takes in this serendipitous experience can be seen in Participant 7's explanation, when they noted:

The process is present in every area of work, but I find I experience it most when my mind is processing information, linking ideas from different authors or in analysing recently collected data (P7).

The Fact-Checking Stage, where the evidence that had been gathered from the previous stage was analyzed, held the possibility of serendipity for 12 participants. Even more than Participant 7 above, Participant 24 described their own role in creating the conditions for serendipity to occur:

If I don't experience serendipity while reading, then I do right before or while I write because I go through my notes and highlight all the similar or dissimilar points across

sources; that is when I realize a particular source has a particularly illuminating point (P24)

Participant 24 was not alone in mentioning a stage that occurred 'right before' the writing process begins. Several other historians mentioned this stage, which lies outside the scope of Lundy's (2008) stages of the historical research process. For these historians, this stage occurred after the analysis, and was a time of re-organization of their research material that occurred before they started putting their stories on the page.

Finally, the Writing Stage was linked to serendipity for 21 of our participants. Much like the term research above, the act of writing was rarely described. Participant 8, noted

It also happens when writing a paper, as the writing process engenders thinking. (P8)

But the 20 other participants who listed writing as a part of their research process were content to leave out any further description.

Perhaps the most vivid answer of serendipity in the historical research process comes from Participant 71, who reflected on the various stages of their research process, and disagreed on the final Writing Stage being prone to serendipity. Their answer is worth quoting here in full:

Hard to answer that. Certainly one is most open to serendipity at the early-to-middle stages of a project. Too early in a project, there is simply nothing for serendipitous inputs to stick to. You don't notice what you aren't looking for. In the late stages of a project, you stop looking for discoveries. You don't want and aren't open to game-changing discoveries. The early-middle stages of a project where you have ideas but they are still messy, inchoate, flexible is the time one is probably most open to serendipity. (P71)

The answers from historians indicated that there are several stages of their research process where serendipity has been experienced. While this is predominantly during Lundy's (2008) middle stage of Data Analysis and Collection, many historians also experienced serendipity while preparing their minds to write their stories, or during the act of writing itself.

3.6.2   Serendipitous environments

Digital and Physical Environments

As mentioned in the Methods II section, 58 participants answered the question "Please describe where in the research process you most commonly experience serendipity" by talking about their work environment. Though this was not intended when we developed the interview question, these answers illuminate how different information environments played a role in participants' experiences with serendipity. There were 36 participants who mentioned a physical information environment; most commonly the archive where they performed their research. For these participants, it was largely the unknown aspects of an archive that led to these chance encounters with material, as Participant 4 notes:

When you don't know what exactly you'll find in a box of records. (P4)

For Participant 63, it was the lack of information surrounding the material they work with at the archives that lead to serendipitous finds:

In the Indian Office at the British Library, which lacks a full descriptive index - thus finding useful and interesting sources within these documents is a common occurrence. (P63)

Although the archive was the primary physical location that the participants mentioned, the library and its bookshelves were another environment in which serendipity was often experienced. Participant 66 describes this experience:

Either a book nearby on a shelf or an article in another part of the journal that I just happened to see out of the corner of my eye. (P66)

Both the digital counterparts of the physical library and archives were mentioned as information environments where serendipity has occurred for these historians, though the number of participants who mentioned this were about half as many as those who mentioned experiencing it in physical spaces (see Table 4 above). The comfort that some historians had with digital environments was shown in these responses, such as Participant 30, who stated:

Browsing/using full text searches on web archives, while doing topic modelling…(P30).

Many participants who spoke of their information environment described both the physical and the digital. Participant 50, for example, writes of commonly experiencing serendipity

while reading the local or cultural section of the newspaper sometimes also after work while surfing on the internet. (P50).

Finally, Participant 18 not only describes interacting with information in both environments, but comments on the nature of the serendipity they experience therein:

Often, I find a book that becomes germane just from walking around the stacks, or a website that's critical when clicking through web archives. Of course, I know this isn't true serendipity - it's because books are clustered together, and research tools are driving me in certain directions - but it feels like it (P18)

Social Networks

Twenty participants spoke of their connections with research material happening through or during conversations with other people. This commonly occurred at conferences with their colleagues that were described as

The social/white space for making unplanned connections. (P34).

The Internet and social media tools were shown to be a factor in historians' information behaviour. The serendipitous nature of Twitter has been described elsewhere by Digital Humanities scholars (Quan-Haase, Martin, & McCay-Peet, 2015). For several historians, Twitter played a role in what Participant 31 describes as 'facilitated serendipity':

I most often experience this facilitated serendipity through conversations on Twitter or other social media. (P31)

For Participant 51, while lectures and conversation with others had resulted in serendipity, it was largely YouTube that supplied their mental connections:

Either at lectures, in conversation, on YouTube. I find many hugely provocative clues on Youtube channels. (P51).

Finally, talking to others was a way of not only clueing into material or methods that they might not be aware of, but also a way of spreading the word about their research in order for connections to be made through their larger social network. This active role in information sharing, for Participant 64, is a way of creating one's own luck:

I think you make your luck - and the more people I have told about my research the luckier I have been that they have shared contacts and information. (P64)

3.7   Narrating Serendipity Stories

The two different types of answers to Q13 provided much more description than we had anticipated. During the creation of the survey instrument, we wanted to elicit stories from our participants, by asking them to describe a recent serendipitous experience. The procedure of eliciting stories is common in LIS, and is based on Flanagan's (1954) critical incident technique, which he claims "is essentially a procedure for gathering certain important facts concerning behavior in defined situations" (p. 355). Makri and Blandford (2012b) used critical incidents in their study of interdisciplinary researchers experiences of serendipity, and summarized their participants stories for simplicity and purposes of comparison. As we were working with survey answers, the participants' responses were not extensive, and we were able to use the historians' own words for our analysis. The third open-ended question in the survey appeared as follows:

Q14: If possible, please describe a recent serendipitous experience that occurred during your research. Provide context in terms of what you were doing, where and how did serendipity occur, what relevance did it have, etc. If you can't recall a recent experience, please leave blank.

3.7.1   Methods III

As the answers to this question came largely in the form of stories, we decided to perform a narrative analysis. As Riessman (1993) notes: "[n]arrative analysis allows for the

systematic study of personal experience and meaning: how events have been constructed by active agents" (p. 70). For the present study, this method of analysis shows the meaning of these events for our participants, linking their emotions and thoughts throughout historical research. As Bates (2004) notes, "How study participants report and narrate episodes from their everyday life reflects the factors which influence their behavior" (p. 17). We believe that this choice of analytic method helped us to gain a comprehensive understanding of serendipity as historians experience it.

One of the key players in narrative analysis is William Labov, whose work with Waletzky on narrative structure (1967) and whose *Language in the Inner City* (1972), laid the groundwork for narrative studies, including work on gender, politics, and discourse (Riessman, 2008). We employ Labov's model for the structure of a narrative below as a framework to understand our historians' serendipity stories. By breaking down the historians' stories about their experiences with serendipity into the common elements in a narrative (Labov, 1972), and by paying special attention to keywords and verb tenses used by the narrators themselves (Riessman, 1993), this analysis investigates (a) how serendipity occurs for these participants, (b) what it means for their research, and (c) how representing their own experiences with serendipity as narratives helps them to persuade their audiences of its importance.

Prior to beginning this task, however, it was first necessary to examine the answers to determine if they included each of the elements that the question required: context of historians, setting for serendipity, and relevance of experience. Any information additional to these three elements was seen as beneficial, but without these three elements being specified, the stories would not easily lend themselves to a narrative representation. This initial examination showed that 34 of the historians' stories (out of the 60 that chose to answer this question) were complete. These 34 stories provide the basis for the following narrative analysis.

Using Labov's model as the first stage of a narrative analysis allows us to answer the "so what?" question that every good story must ward off (Riessman, 1993, p.20). In particular, the evaluation of the story, when the narrator indicates the significance of the

actions they are representing for their audience, is of importance here. The 'so what' of a serendipity story should persuade and inform audiences of the reason that this experience matters.

The Labovian model of the structure of narrative has six parts:

1. Abstract (summary of the substance of the narrative)
2. Orientation (time, place, situation, participants)
3. Complicating action (sequence of events)
4. Evaluation (significance and meaning of action, attitude of the narrator)
5. Resolution (what finally happened)
6. Coda (return to the present)   (Labov, 1972)

The present study follows the stages of narrative analysis as set forward in Riessman (1993), with obvious omission of the telling and transcribing stages of these processes which were not necessary when the stories were written by the participants. Riessman and other scholars of narratology work with extended narratives derived from interview data. Open-ended questions were constructed to "generate detailed accounts rather than brief answers or general statements" (Riessman, 2008). Czarniawaska (2004) notes three methods of collecting stories for analysis: 1) recording spontaneous incidents during field research, 2) eliciting stories in interviews, and 3) asking for them. In the discussion of her third method, she notes the need to include written stories in the data for narrative studies and discusses how this strategy of asking for stories is similar to Flanagan's (1954) critical incident technique, a connection made in the present paper (see Section 3.7). In Q14, we asked our participants to describe their serendipitous experience, provide context for said experience, and to discuss its relevance. Though some of the participants might have objected to having to provide a lengthy answer and made the decision not to respond (Reja et al., 2003), we felt that the 34 answers we obtained through this question were spontaneous, thorough, and provided sufficient detail to warrant a narrative analysis.

Though transcription was not required in the analysis of these survey answers, some elements of transcription (re-organizing the data into numbered lines, applying Labov's

framework) were included in the parsing of these narratives of serendipity (Riessman 1993). Once each of these narratives of serendipity had been re-transcribed, they were assessed according to two factors: a) the six-part Labovian model and b) the 7 Serendipity Components we developed from the historians' responses to RQ1. To demonstrate the analysis, Figure 9 below provides the narrative by Participant 59. This was chosen as a sample because it is short and has a simple storyline, and the content should not be regarded as representative of the historians' narratives.

Title: "Perfect for my defence"
Participant #: 44

Original Narrative	**Re-transcribed Narrative**
I have recently been writing about autobiographies, and needed books and articles talking about how truthful they are. I saw someone give a talk at a conference whose source was also autobiographies, and she mentioned something she had read that I hadn't heard of but was perfect for my defence.	1 I have recently been writing 2 about autobiographies, 3 and needed 4 books and articles 5 talking about how truthful they are. 6 I saw someone 7 give a talk 8 at a conference 9 whose source was also autobiographies, 10 and she mentioned 11 something she had read 12 that I hadn't heard of 13 but was perfect 14 for my defence.

Narrative Analysis

Labovian Structure of the Narrative	**Labov's model applied to Re-transcription**	**Serendipity Components (SCs)**
Abstract	1 I have recently been **writing** 2 about autobiographies, 3 and needed 4 books and articles 5 talking about how truthful they are.	Active Research Methods
Orientation	6 I saw **someone** 7 give a talk 8 at a **conference** 9 whose source was also autobiographies,	People Environment
Complicating Action	10 and she mentioned 11 something she had read	
Evaluation	12 that I **hadn't heard of** 13 but was **perfect**	Un-factor Descriptions of the Find
Resolution	14 for my defense.	
Coda		

Figure 9 Example of Narrative Analysis

Once this analysis was performed on each of the 34 narratives, we wanted to see how many times each of the 7 SCs were used in these definitions, and during which of Labov's 6 stages these usages occurred. The final numbers for this are in Table 5.

Table 5 Historians' Components of Serendipity in Labov's Narrative Structure

	The 'Un'-factor	Active RM	Desc. of the Find	What Find Does	Connection	Location	Eureka	Total
Abstract	1	3	0	0	0	2	0	6
Orientation	2	30	0	0	4	15	0	51
CA	5	41	7	2	3	6	2	66
Evaluation	18	3	25	8	4	0	0	58
Resolution	4	6	3	15	2	1	0	31
Coda	2	2	0	1	0	0	0	5
Total	32	85	35	26	13	24	2	

3.8   Findings III

Analyzing these serendipity stories using Labov's narrative structure allowed us to understand what the historians were describing at each stage of their narrative. These narratives involve, to varying degrees, each of the 7 SCs previously defined by the participating historians (see Findings I). Breaking down these narratives into Labov's six stages has shown that these elements play unique roles at different times, and that they work together as a story that persuades the audience that serendipity has occurred. The following section will outline each of Labov's stages and demonstrate which of the SCs were employed in each stage, and for what purpose.

3.8.1   Abstract

Perhaps because the historians were answering a single question in text instead of partaking in an interview, there was largely no need for an abstract, or summary statement of the story to follow. Only six of the participants' narratives included abstracts, and these were often just repetitions of what the later expanded on in the orientation and complicating action steps.

3.8.2   Orientation

The orientation section, in which the historians informed their audiences of the setting, characters, and situation for their narrative, played a crucial role in these serendipity stories. All 34 stories involved an orientation, with the historians laying the groundwork

for serendipity through anything from a few words ("I was a student at my university"
P3) up to several sentences, like Participant 48:

> 1 The main part of my PhD research
> 2 was using nineteenth-century
> 3 divorce and separation records
> 4 from Edinburgh's Court of Session records.
> 10 committed in their home town in Fifeshire, Scotland.
> 12 Another portion of my PhD
> 13 examined poor relief records
> 14 to illuminate the lives of deserted wives.
> 16 one on the west coast of Scotland
> 17 the other on the east coast.

The setting and situation are extremely important if the audience is going to become
invested in the story that follows. The historians' orientations largely placed them in a
time period of their research ("Background reading for my thesis chapter" P43), a
location where this took place ("combing through archival newspaper articles" P56) or
introduced other people that played a role in their chance encounter ("A man I met
posting a letter" P39). Few stories, like that by Participant 7, involved all three:

> 1 Going through
> 2 part of the Canadian Lesbian and Gay Archives   (Location)
> 3 (for dissertation research)   (Time period)
> 5 I found things in boxes in the basement
> 9 in an offsite storage facility of that same archives,
> 12 I was working with a volunteer archivist   (People)
> 13 who had a 'sense' of what was in the boxes,

Whether it was a combination of location, time, people, and situation, or simply a
detailed account of one of these factors, one thing stood out in the orientation: the role of
the researchers themselves. "Active Research Methods", defined in Methods (I) above as
"the verbs used to describe participants' own behavior", were the most prominent to
feature here. "Researching", "Finding", "Looking through", and "Working on" are just a
few of the examples of verbs that these historians used to describe their own agency in
their work, and to orient their audiences to the rest of the story.

3.8.3   Complicating action

Another step of Labov's structure that was a part of all 34 narratives was the
complicating action. As with orientation, the role of "Active Research Methods" was the

most prominent element at this stage. However, instead of the historians describing their general research practices, these behaviours were targeted towards finding information. Some historians spoke of information they found online, using verbs like "Called up", "Spotted", or "Googled". Others spoke of the way they interacted with physical environments: "Walking through", "Moved", or "Collected". Both types of location seemed to spur serendipity stories.

There is an curious juxtaposition, however, of verbs used that imply an element of chance, which imply that the item in question has an agency of its own. Verbs such as "encountered", "came across", or "stumbled upon" are used by the historians to describe research behaviour that, during the orientation stage, was reported as actively seeking information. It is from these encounters that a new set of verbs emerged, verbs that help to bring the agency back to the historian. Words such as "noticed", "realised", and "recognized" were used multiple times by the historians to describe the sequence of events that led to serendipity.

One story that involves examples of the different ways that agency is implied is by Participant 8:

8 **looking** through the card catalog	
9 (physical card catalog)	
10 for information on one topic	
13 **Going through** that card drawer,	(Physical Environment)
14 **I came accidentally**	(Implies chance)
16 upon a nearby card	
18 This caught my eye	
23 **I requested** the item in question	(Participant has agency)
24 **realized** that	(Participant has agency)

When actively looking through a card catalog, one would surely expect to 'come upon' research material. However, when framed as a serendipity story, the complicating action implies an accident or chance occurrence that leads to a find, which in Participant 8's case, is a realization that a previous interest might make a good seminar topic.

3.8.4   Evaluation

For Labov (1972), two main elements make up the evaluation stage of a narrative: 1) the significance of the story is shown and 2) the attitude of the narrator is exposed. Both descriptions together play a unique role in these serendipity stories: they persuade the audience not only that what they are reading is important, but also that serendipity has indeed occurred. For our historians, their own evaluation of the situation, complicating action, and discovery, serve as persuasion points in their serendipity stories.

There are two elements of historical serendipity that feature prominently in the evaluation stage: "The 'Un'-factor", which largely serves to show why the story is significant, and "Descriptions of the Find", in which details of the object found or connection made serve to make the story believable. Let us examine these in closer detail:

The 'Un'-factor

Over 50% of the time that participants used words to indicate an unexpected interaction with research materials occur during the evaluation stage. The historians are constantly reminding us that the material they came across in their research was something they "would never have expected", "didn't know mattered", or "was unrelated" to the work they were doing at the time.

There is another side to "The 'Un'-factor" as well: when the historians use these descriptors to show how unknown or unique their findings are. The participants often spoke of their finds as something that only they could have uncovered, which, while possibly true, lends credibility to their role as historians. What makes a historian's work stand out is the exclusivity of their findings. This might be in the way they bring the sources together to tell a story, or in the unknown information contained in their sources. With the latter, finding a completely 'new source' is greatly desirable. Thus, when the historians use statements like "was previously not known", "I had not known", or "had not been covered by specialists", they are working to persuade their audiences of the significance of the find.

Descriptions of the find

This form of persuasion continues in the historians' "Descriptions of the Find". Much like the verbs used in their own definitions, words like "luckily", "accidentally", and "pure coincidence" were used to convey their opinions on just how important a role chance played in the experience they are retelling. They also work to persuade the reader that the item found was going to be put to good use with descriptors such as "particularly useful", "invaluable", and "perfect". Some of the descriptions of the sources these historians found sound unbelievable, even to themselves. Participant 13, for example, claims that her sources were so "blatant" in their support of her hypothesis that they were "outside [her] wildest dreams".

Participant 55's evaluation stage shows how clearly how the narrator is trying to convince the audience of his serendipitous experience:

> 25 In other words,
> 26 there was **no way I could have found** (Un-factor)
> 27 that previously **unknown** anchoritic guide (Un-factor)
> 28 other than **coming across**
> 29 **one single reference** in a random (Description)
> 30 nineteenth-century antiquary's ramblings,
> 31 unless I had happened to see the manuscript
> 32 **(extremely unlikely!)**. (Description)

Not only does Participant 55 show the unlikelihood of their find and how slim the chances were of them coming across this single reference, they also feel it necessary to repeat for their audience how "extremely unlikely" it was that this entire experience occurred at all.

3.8.5   Resolution

Although it would seem that no story is complete without answering the question "What finally happened?" (Labov, 1972), nine of these historian's serendipity stories do not include this stage in their narratives. This, like the missing abstracts noted above, may be due to the nature of the story being told on the page, as opposed to in person. Regardless, 25 stories did include resolutions, and the majority of them included the SC "What the Find Does". These descriptions of the way in which the encountered material affected or

altered the historians' work occurred in two ways: it was the beginning of a new idea, or it ended up being a part of their research. First, the historians spoke about the find leading them to further investigation with statements such as "spurred a new line of inquiry", "put me on the right track", or "led to a YouTube streaming". These statements connect the audience to the research path that the historians were on, and show that serendipity is a well-remembered moment during their search. Second, the result of the find is described in phrases such as "ended up serving as an opening anecdote", or "answered some questions I had". These phrases follow on from the evaluation stage, show what happened next, and once again serve to convince the audience that serendipity occurred. In both of these methods of describing "What the Find Does", the object or information that makes up the find is shown to have agency. It is not the historians who thought of a new idea, but the find that "spurred" this "new line of inquiry". Participant 48's resolution shows what happens when both of these descriptions are retold and also shows the role of agency at work.

35 This alternative record	
36 **provided insight**	(Find has agency, provided
37 into how the wife coped after being divorced,	idea)
38 and **allowed me to** find and	(Find has agency)
39 **follow her historical footprints**.	(Find = part of research)
40 **It also indicated**	(Find has agency)
41 **further avenues for research.**	(Find provided idea)

Rather than telling their audience about the great record that they found and how they were inspired to look further based on their reading of the record, Participant 48 frames their serendipity story around an object that changed the course of their research.

3.8.6   Coda

The coda, or the point when the narrator returns the story to the present, was only featured in 12 of the 34 serendipity stories. Though this is likely because, without being in a conversation, the only present that the historians had to return to was their own. Those that did include a return to their present state usually did so by simply reviewing what effect the find had on their work, by bringing their audiences back to 'now'.

Examples of this include "now I have compiled significant information", "now I have a copy", and "which I will now incorporate into the chapter".

A couple of the historians used this final section of their narrative to echo the sentiment of serendipity expressed in the story, once again reinforcing how one simple act of noticing impacted their work:

> 32 all because
> 33 I saw a flyer
> 34 in the library
> 35 while returning a book. (P51)

OR

> 24 When I began that archival trip,
> 25 I liked reading height studies
> 26 but never expected to perform one
> 27 did not go looking for the source. (P28)

Each of the six stages in this Labovian analysis demonstrates how the different SCs are used in the historians' narratives. One of the seven SCs derived from the historians' own definition of serendipity, "Connection", was present in only a few of the narratives, and did not feature heavily in any one stage. The SC "Connection" was mostly used to describe how the find fit in with their research, and it was difficult to distinguish these descriptors from those that belonged in "Descriptions of the Find". The orientation, complicating action, evaluation, and resolution stages of the narratives all had one or more SC that featured prominently amongst the stories, as shown in Table 6. While the beginning (abstract) and end (coda) of the narratives are not included by all of the historians, when they are present they work to support and reinforce the aspects of serendipity in body of the story.

Table 6 Serendipity Components (SCs) in the Narrative Stages

Labovian Stage of Narrative	Historians SC
Orientation	Location / People / Active Research Methods
Complicating Action	Active Research Methods
Evaluation	The 'Un'-factor / Descriptions of the Find
Resolution	What the Find does

3.9   Discussion

The definitions and descriptions of serendipitous experiences in historians' survey answers provided us with a wealth of information. One complication of trying to define serendipity from the responses to Q11 (Please provide a definition of serendipity (as it pertains to historical research) in your own words) is the sheer range of answers provided. As discussed in Methods – Serendipity in the Research Process (Section 3.5.2), we found that the use of an LIS model of information seeking such as those by Ellis (1993) and Meho and Tibbo (2003) did not accurately reflect the words and phrases used by historians in describing their research behavior. There are a couple of reasons for this. First, the terminology used by different disciplines in academia varies widely. For example, what we categorized under "Social Networks" in this study was any mention of communication between historians and their peers that they discussed in relation to a serendipitous experience. At no time was the term "social network" used by historians, even though they might have agreed that the term was fitting if they were asked. However, the LIS community frequently uses the term social networks to discuss information exchange amongst people (Borgman et al., 2005; Given & Leckie, 2003; Haythornthwaite, 2006). Thus there is a discrepancy between the way one academic culture (LIS) describes another (historians), and the way that the latter describes their own research behavior. Second, there is the matter of the survey format, which does not allow for or generally encourage lengthy responses, and, for the purposes of this study, resulted in many brief answers that only offered partial reflections on what the participants were doing when they experienced serendipity. Finally, whether or not the participants are responding in survey format, it is possibly difficult to reflect on one's own work and information behavior, the details of which may seem mundane or trivial when they are not the focus of research. Though we could have created a quantitative survey answer where historians simply checked boxes to indicate the stages of their research where they commonly experience serendipity, we believe our decision to let them speak for themselves, and to select a simple model that is flexible enough to incorporate their responses was the wisest decision.

The discrepancies between the vocabularies of LIS and history were also difficult to overcome when creating a definition of serendipity from the participants' own words. The detailed content analysis outlined above resulted in seven SCs, which were derived from an analysis of in vivo codes from the historians' responses. Each of these SCs therefore represents an element or component of serendipity, as historians describe it. We then used these 7 SCs as a part of the narrative analysis of the historians' serendipity stories, to test whether each of the components of their definitions featured in their personal experiences. Figure 10 shows the definition of serendipity that was developed to include the SCs, as described to us by the historians.
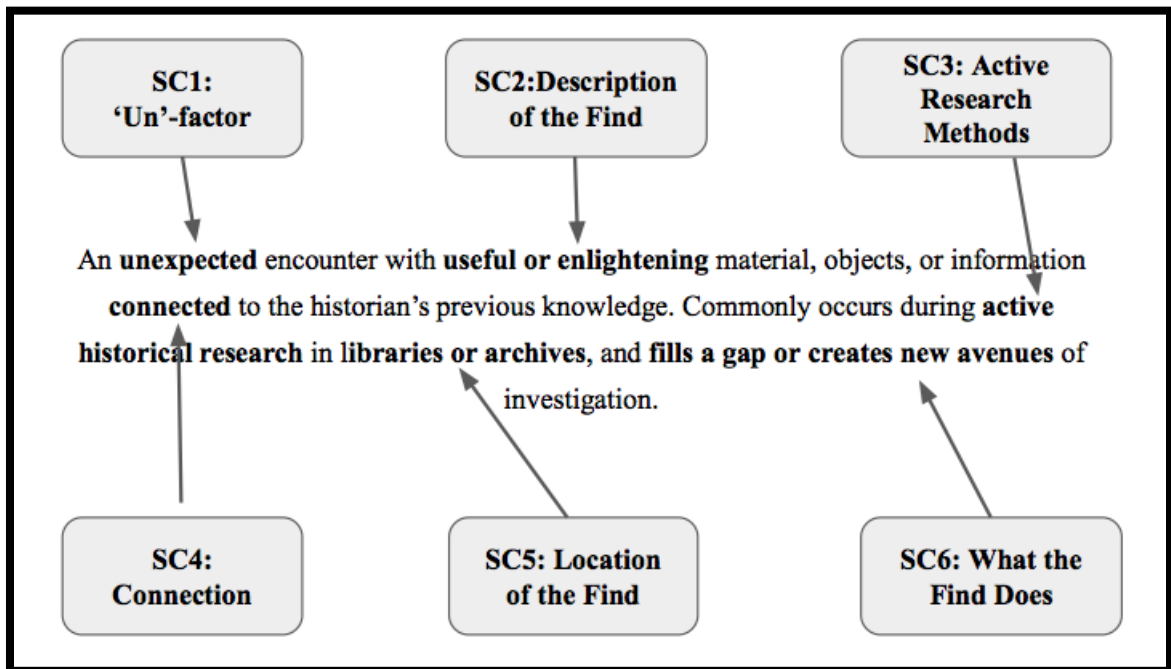
Figure 10 Definition of Serendipity in the Historical Research Process

It was decided to only include six of the original seven SCs are included in the final definition (Figure 10). This is because the SC "The Eureka Moment" was determined not to be integral to historians' own definition of serendipity. It was employed by only 15 of the 91 historians in their definitions, and referred to by only two historians in their serendipity stories, prompting us to omit it from the final definition.

Building the definition through a series of components proved extremely valuable throughout the analysis of the serendipity stories. Using these seven elements and investigating how they were employed throughout the narrative responses of the historians allowed us to reflect not only on how these scholars defined serendipity and how they experienced it, but also to postulate why framing their research experiences as serendipity has proved so popular. Three main themes permeate the analysis of all of the research questions: agency, persuasion, and the unexpected. The next three sections will explore each in more detail.

3.9.1   Agency

As scholars who are trained to methodically and actively seek information throughout their research, historians should be well aware of the role they play in this process. They should also be aware of the role they play in the experience of serendipity. The agency of these historians was evident throughout our findings: They include their active research methods in the definitions of serendipity, they recall themselves exploring and collecting data when they most commonly experienced serendipity, and they present details of these same active research behaviours in their serendipity stories. Bandura's (2006) four core properties of agency (Intentionality, Forethought, Self-reactiveness, and Self-reflectiveness) are useful here to demonstrate the role that the historian's agency takes throughout the serendipitous experience.

Intentionality occurs when "people form action plans and strategies for realizing them" (Bandura, 2006, p.164). There are two types of action plans evident from the historians' accounts. First, some historians strategize by looking for something specific: an answer to a question, or a research gap they want to fill. Second, and more directly associated with serendipity, are historians who are aware of the need to remain open to information and employ strategies that will put them in the way of previously unknown sources, places, or people.

Forethought, or setting goals and anticipating outcomes, is a natural part of the historical research process. As scholars who have an information need, they form a hypothesis about their historical topic and create ways of carrying through on the action plans. The

participating historians describe many places they visit during their research, and having to make plans to visit archives, libraries and to gain access to online collections that house their materials. Many of them described talking to their peers, both online and in person, who were able to provide them with information that could help in their search.

Self-reactiveness, or the "ability to construct appropriate courses of action and to motivate and regulate their execution" (Bandura, 2006, p.165) was demonstrated through the historians' active pursuit of knowledge. More than just knowing where information could be found, they went in search of it, and many of them continued looking even after they felt they had hit a dead end. Importantly for the present study, these scholars were able to recognize when serendipity had occurred and used their newfound information to guide them through further research.

Finally, **self-reflectiveness,** or self-examination, was evident in the way that the historians chose to answer the questions surrounding serendipity. These scholars did not go about their work haphazardly, but were well aware of their methods and could recall locations, people, objects, and conversations they had along their research path. Framing these experiences as stories serve as a way for historians to preserve a part of their research process, to reflect on what they knew prior to their serendipitous discovery, and to think about how this experience moved their research forward.

Using Bandura's (2006) properties of agency we can therefore show that the serendipity stories provided in answer to Q3 demonstrate the historian's own understanding of their role in the research process, and in the experience of serendipity. But there is another form of agency that plays a role in the historian's serendipity stories: the agency of the find.

In both the definitions and serendipity stories, agency seems to dance between the historians and the objects or materials that make up the find. The SC "What the Find Does" shows this clearly, as active verbs are repeatedly associated with objects that change the course of one's research, or supply the historian with a novel idea. What is it that makes the historians assign agency to these objects, instead of taking responsibility

for these actions themselves? Here it may be useful to return to Foucault's concept of heterotopia.

As discussed in the introduction, Foucault (1986) used the term heterotopia to refer to a "mixed, joint experience", where one might feel one was in two places at once. Radford et al. (2015) also apply the term to the library, arguing that the library's ordered arrangement and the multitudes of data it contains are ripe for discovery. For the historians in the present study, the concept of a heterotopia also appears to apply to an archive or to a conference, any location in which the information gained places the historians outside of themselves for a moment, and causes them to reflect on a current question or concern they have been mulling over. The sensation that occurs when one's thought processes are interrupted by an object, person, or other finding that spurs a connection is indeed "uncanny", a term employed by Tamboukou (2015) to describe this feeling. Perhaps it is this uncanny experience of serendipity, this "mysterious, weird, uncomfortably strange or unfamiliar" moment that is exactly what makes serendipity in the library or archive so memorable for these historians (OED "uncanny", 2015).

Radford et al. (2015), in their interpretation of Foucault (1986), postulate that "serendipity is thus the mechanism through which heterotopia operates" (p. 744) and we believe our findings in this study support and further this notion. The historians know they are agents in their own research, they are aware that they create their own research path, yet they still connect their own hard-earned finds with serendipity: Serendipity that occurs through objects with their own agency. By assigning agency to objects within their serendipity stories, the historians are able to acknowledge the heterotopic experience that occurs when, as Tamboukou (2015) puts it, they "prehend something in [their] 'data'"(p.14 ft 16). The moments when the connections between material starts to make sense might feel strange, and chances are that the reason that this material is important might not be immediately comprehended. However, upon retelling their serendipity stories, it is easier, (and more interesting!) to assign the agency to an object which "came their way", or "opened a door", than it is to explain the feeling that heterotopia, operating through serendipity, creates.

3.9.2   Persuasion

In section 3.1.1 above the review of the literature on the chance encounter in historical research with a couple of questions. I return to them now:

Why do historians choose to remember and represent their research experiences through the lens of serendipity? Why not demonstrate the hard work they put into finding their sources, and highlight instead their own abilities of insight and observation?

These questions can be addressed if we carefully examine the role of persuasion in the serendipity stories. The locations in which these historians' stories took place in, and the people they described in their Orientation to these stories, are both connected to ways that these historians perform their identities, or show to others what it means to be a historian. Working with primary documents, discussing their research with their peers, and benefitting from the help of a trusted archivist are all representations of what it is to do historical work. In both the Complicating Action, where the historians describe the uncanny moment of distraction, and in the Evaluation, where they tell their audiences why this was important, the historians are working to persuade their audiences that what they are representing through their story is indeed serendipitous. This is another layer of performing their identities, as historical research is based upon finding something new or unique to the historical record. This oftentimes can be looking at a document though a new lens, or comparing documents to discuss new theories, but an as yet undiscovered document or piece of material is central to historians. Who, then, makes up the audience that these serendipity stories persuade? This is not an easy question to answer.

For the serendipity stories presented as answers to our survey, one obvious answer is us, the researchers who inquired and asked for the stories in the first place. However, the number of survey responses we received shows that the serendipitous experience is not uncommon, a fact which is also supported by the serendipity stories relayed throughout historical literature (Hoeflich, 2007; Kirsch & Rohan, 2008; McClellan III, 2005; Nissenbaum, 1989). Thus, our asking for them makes us one audience for these stories, but there are others, two of which are most likely 1) the historians themselves, and 2) members of the historical profession in general. For the historians who recounted the

serendipity stories, repeating the occurrence back to themselves is necessary to understand it. The recognition that serendipity has occurred often happens well after the object or information is found, and usually only when the positive outcome of finding that material is realized. Thus, the historian repeats the story to themselves as a method of both remembering their experience, and of persuading themselves of the importance of their find.

The final audience for these stories is members of the historical profession in general. Tamboukou (2015) problematizes serendipity in the archive, and argues that historians should be more careful to reflect on these experiences as something more than the result of chance. She notes that historians "are not always cognitively aware of how busily modes of perception function before we enter the phase of conceptual analysis where of course conscious knowledge emerges" (p. 11). This lack of awareness describes the time it takes for historians to recognize the occurrence of serendipity. If the historians themselves are not yet sure of a connection or a positive outcome, how can they describe this to other historians, except to frame it as a serendipity story? They tell their colleagues, peers, and students to use these information spaces to browse, to skim, and to seek information all in the context of what they may find. These serendipity stories become tales of lucky historians, and serve to convince their audiences of the magic of the archive, the luxury of the library, and, above all, the wonders of historical work.

3.9.3   Expecting the unexpected

The concept of chance has played a role in serendipity since the word was coined. It has been linked to serendipitous discoveries (Merton & Barber, 2004) and is included in models of serendipity (Rubin et al., 2011). In a recent investigation of serendipity, McCay-Peet and Toms (2015) link the role of chance to the unexpected or accidental aspect of serendipity, which featured prominently in our participants' definitions and serendipity stories through "The 'Un'-factor". How do we reconcile the agency being exerted on behalf of the historian in these serendipity stories with the element of chance? Are these so called unexpected finds really unexpected at all?

The widespread use of "The 'Un'-factor" (words used by participants to indicate the unexpected interaction with research materials) throughout the historians' definitions of serendipity is striking, considering the participants also acknowledge they are seeking information in the act of research. How can so many historians claim to be surprised that they find information (most often related to their inquiry) in the very place they were seeking it? True, some of the finds described by the historians were obtained in unusual ways or found in unusual sources, but claiming they were completely unexpected seems odd, given the circumstances.

In his vivid description of the times in the research process when he experiences serendipity, Participant 71 noted; "Too early in a project, there is simply nothing for serendipitous inputs to stick to. *You don't notice what you aren't looking for.*" This statement appears to be contrary to the participants' claims regarding serendipity. Where the historians use "The 'Un'-factor" to describe their "accidental" or "unexpected chance encounter" with research material, they are actually describing the moment when a useful connection is comprehended. Some part of the historians' well-prepared mind recognizes the significance of the material they have encountered. If the find were something they did not expect to ever encounter or were not aware of in some way, the chances of them noticing it would be quite slim.

Whether or not the serendipitously found material, person, or information answered a question that was top of mind at the moment of recognition, something in the historians' memories recognizes a connection between this find and what they already know (Rubin et al., 2011). These scholars are trained to analyze, gather, and interpret historical material. When these serendipity stories took place, they were working in environments where they were comfortable, and intentionally spoke to people they knew could help them in their quest for information. Whatever it takes to get to the "perfect" or "tailor-made" material, it is clear that these historians are leaving very little to chance. Throughout their historical training and work in libraries and archives, one lesson historians learn is to expect the unexpected.

3.10   Conclusions

Through a multi-method analysis of survey answers, this study identified six Serendipity Components and from them derived a definition of serendipity in the historical research process:

> An unexpected encounter with useful or enlightening material, objects, or information connected to the historian's previous knowledge. Commonly occurs during active historical research in libraries or archives, and fills a gap or creates new avenues of investigation.

We found that physical and digital information environments are both important for historians' serendipitous experiences, and that historians often involve other people in their research behaviour in both of these environments. The participants experienced serendipity at all five stages of historical research (Lundy, 2008) but the two stages where it was more frequently experienced were Data Exploration and Collection, and Writing the Narrative. Throughout both stages, it was found that the historians took an active role in their chance encounters, by recognizing the connections between material and following the paths made by these connections.

Finally, a narrative analysis of 34 serendipity stories according to the six-stage Labovian model demonstrated that the SCs played different roles in each of these stages. The stories recounting historians' experiences with serendipity largely reflect their definitions, with the exception of the SC The Eureka Moment, for which minimal evidence could be found. Analyzing each of the SCs and where they fit into the Labovian analysis allowed us to draw two main conclusions:

1. Historians are active agents in their own experiences with serendipity;
2. Historians are trained to look for the unexpected.

These conclusions point to several areas for future research. Narratives of serendipity provided by other groups of scholars could be used to test the Labovian analysis employed here. Further investigation of the role of the individual in experiencing serendipity is also warranted, as are studies that offer further reflection on the role of agency in this unique experience.

3.11   Limitations of the Study

As with every method of obtaining information from participants, surveys have their limitations. Although this method allowed us to gather a much larger sample than our previous study where we conducted interviews to obtain the opinions of historians, the information gathered in this survey was limited in scope. While the definitions and descriptions of serendipity that the historians provided were quite detailed, there was always room for more questions. Interviews or focus groups would have allowed for those answers to be further probed in order to gain insight into their thoughts on serendipity in their research process.

Due to the nature of survey answers, the serendipity stories provided by the historians only extend so far, and we were unable to obtain the close relationship with our participants that those who do narrative analysis often seek (Connelly & Clandinin, 1990). The nature of the narratives was altered as well. When writing down answers, respondents can take the time to think about their words in a way that interviewing might not allow for, resulting in a more carefully crafted narrative. This was not necessarily a limitation for the serendipity stories, but likely took away from some of the more natural elements that would have arisen if the stories were spoken, instead of written. This was demonstrated in the narrative analysis, where the Abstract (beginning) and Coda (end) of the stories were largely omitted (Labov, 1972).

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Article Three

4 "A Process of Controlled Serendipity": An Exploratory Study of Historians' Experiences of Serendipity in Digital Environments

In 2005 the historian Patrick Leary published his seminal paper "Googling the Victorians". In this forward-thinking article, Leary reflects on the recent changes the practice of history has undergone and debates the pros and cons of history on the Web (Leary, 2005). He presents his readers with a narrative of a recent "fortuitous electronic connection" he experienced while searching Google for a Victorian term whose meaning had eluded him. Leary then sums up the differences between historical work in physical and digital environments in a paragraph that makes it difficult to believe it was written over ten years ago. It is worth quoting here in full:

"It has been often and rather piously proclaimed (by myself, among others) that googling around the internet cannot possibly substitute for good old-fashioned library research, and this is certainly true. But we are perhaps reaching a point in our relationship to the online world at which it is important to recognize that the reverse is equally true. No amount of time spent in the library stacks would have suggested to me that any of those sources would be an especially good place to look for instances of that particular phrase, and if it had, the likelihood of actually discovering the phrase in a printed edition of any of them would have been virtually nil" (p. 5).

For Leary (2005), it is not the information found that is unexpected, but the sources in which it appears and the frequency and accuracy with which Google provides links to these sources. Unexpected, fortuitous connections on the Web, he demonstrates, are not only possible with historical material, but also with people, as the growing communities of Victorianists and family historians can attest to (Leary, 2005).

A decade after this publication, Leary and several other historians authored responses to the original piece, which were published in the *Victorian Periodicals Review* (Brake, 2015; Fyfe, 2015; Leary, 2015; Nicholson, 2015). These articles respond to many

different elements of Leary's original piece, and, most importantly for the current study, highlight the role of the digital environment in supporting serendipity throughout the historical research process.

Leary's (2015) own response to "Googling the Victorians" shows how the unique experiences with digital materials that he described in 2005 are, ten years later, somewhat ubiquitous and ordinary. Though he claims that serendipitously found information about the Victorians still has the ability to surprise and delight, Leary's 2015 paper is more of a call to arms about the need for informed training and critical thinking about using the Web for historical research. Fyfe (2015), in his response to "Googling the Victorians", highlights various tools that have been created to support serendipity in historical research, but also calls for a "curatorial intelligence", which will help historians to "assess and recontextualize digital objects discovered through techniques now including—even privileging—serendipity" (p. 262). For Fyfe (2015), serendipity is a part of the research process that has been "operationalized" by tools created for the digital environment, which lead scholars down various paths and tangents on their way to finding answers to their historical queries. Brake (2015) demonstrates in her response to "Googling" that historians still require both digital and physical environments, as the former are too focused on searching and do not allow historians to browse for information. Brake (2015) also notes that the fixed objects that were the center of historical research before the Web are now part of larger networks and exchanges. Extending the historian's list of digital tools to include social media, Nicholson (2015), in his own response to "Googling", picks up on Leary's (2005) note that the Web allows for historians to have "fortuitous electronic connections" with their colleagues worldwide. Nicholson (2015) highlights the role of Twitter as a method of communication that allows both historians and the wider public to engage in and share their historical conversations.

This exchange of ideas by Victorian historians highlights two things: First, historians have become increasingly digital over the past decade, using and designing different tools to aid their own research. Second, these scholars are very aware of the role of serendipity in the digital environment. If Fyfe's (2015) notion of curatorial intelligence is anything to

go by, the recognition of a serendipitous connection can be seen as a skill in which historians can be, and should be, trained in.

This is not the first time that serendipity has been mentioned as part of a historian's skill set. Anderson (2010) lists serendipity as an information-seeking method used by historians, one which he claims may never be replaced by the online archival system described in his study. Kirsch and Rohan (2008) in their introduction to *Beyond the Archives*, argue that their collection teaches historians to attend to the facets of their research that "seem merely intuitive, coincidental, or serendipitous" in order to identify areas of scholarly research (p. 4). Following on from previous studies of historians' experiences with serendipity (Articles One and Two), the present paper is a first step in understanding how historians experience serendipity in the digital environment. The digital tools and environments that historians are employing during their research are examined, as are the features that historians claim support serendipity in their research process. Responses to a recent survey on Historians and Serendipity are examined in order to answer the following three research questions:

1) How comfortable are historians in digital environments and what digital environments are historians using to encourage serendipity in their research?
2) How often do historians claim to experience serendipity in these digital environments?
3) Which features of the digital environment do historians feel support serendipity?

4.1   Literature Review: Serendipity in the Digital Environment

In his book "Where Good Ideas Come From", Steven Johnson (2011) devotes an entire chapter to serendipity. He describes various techniques that one can try to inspire serendipitous connections, and tells his readers of his own methods of using a digital environment called DEVONThink to create connections between items and thoughts he

has saved on his computer.[6] Johnson then notes a "puzzling meme" which has surfaced in the media: one that argues that the Web and digital environments are leading to a decline in serendipitous experiences (p. 117). Through a discussion of serendipitous experiences in digital and physical environments, Johnson concludes: "This is the irony of the serendipity debate: the thing that is being mourned has actually gone from a fringe experience to the mainstream of culture" (p.119). For Johnson, the Web has several attributes (connections to a global culture, hypertext links, and information diversity to name a few) that support serendipity. Whether or not all Web users are experiencing serendipity regularly Johnson (2010) leaves up for debate, but he still argues "the Web is an unrivaled medium for serendipity if you are actively seeking it out" (p.121).

Several recent studies by Library and Information Science (LIS) scholars have investigated the role of serendipity in digital environments, focusing on aspects such as the tension between online search and exploration (Quan-Haase & McCay-Peet, 2014), how to observe serendipity in these environments (Makri et al., 2015), and how individual characteristics may influence serendipity on the Web (McCay-Peet et al., 2015). A review of this literature will lay the groundwork for the present study investigating serendipity in the historical research process.

In an attempt to trigger a serendipitous encounter in a digital environment Toms and McCay-Peet (2009) set up an observational laboratory study that saw 96 participants complete three tasks using a Wikipedia-based tool developed for the study, called "Suggested Pages". Forty percent of their participants used the tool, reporting that the links they found through "Suggested Pages" were relevant to their assigned tasks, and were surprising, but some also deemed them as a distraction from the task at hand. The authors concluded that the lab setting did not replicate typical behaviour, and that there was much left to understand about how to trigger a serendipitous encounter with information.

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[6] DEVONthink is an information management tool for collecting and organizing information, which also enables connections between files and documents ("DEVONthink," 2016).

Race (2012) examined the serendipitous features associated with web-scale discovery tools such as WorldCat and EBSCO. She noted the importance of personalizing the search process, and demonstrated that interactivity between the user and the computer system is likely to help users better realize interconnections. The main strength in Race's article lies in her summary of web-scale discovery tools that support serendipity. Here Race managed to break down the various tenets of serendipity (browsability, hypertext links, visualization of results, etc) and determine whether each of the aforementioned tools supports these features.

In a report that accompanied her doctoral research, McCay-Peet (2013) outlined the development of questionnaires she created as "direct measures of serendipity". These questionnaires consist of four questions that are asked of survey participants three separate times, in order to capture the perceived frequency of serendipity in A) a specific digital environment, B) digital environments in general, and C) in general, with no environment in mind. McCay-Peet, et al. (2015) later employed these questionnaires in conjunction with other measurements to analyze the role of the environment and individual differences in experiencing serendipity. They concluded that the "environment matters" when serendipity is under investigation, and called for further development and validation of these questionnaires (McCay-Peet et al., 2015).

In another attempt to investigate serendipity in digital environments, McCay-Peet, Toms, and Kelloway (2014) conducted several studies in which they created and refined scales to measure how well specific digital environments support serendipity. They identified five facets of a serendipitous digital environment as follows:

1) *Trigger-rich*: The digital environment is filled with a variety of information, ideas, or resources interesting and useful to the user.
2) *Enables connections*: The digital environment exposes users to combinations of information, ideas, or resources that make relationships between topics apparent.
3) *Highlights triggers*: The digital environment actively points to or alerts users to interesting and useful information, ideas, or resources using visual, auditory, or tactile cues.

4) *Enables exploration*: The digital environment supports the unimpeded examination of its information, ideas, or resources.

5) *Leads to the unexpected*: The digital environment provides fertile ground for unanticipated or surprising interactions with information, ideas, or resources.

(McCay-Peet, Toms, & Kelloway, 2014, n.p.)

McCay-Peet, Toms, and Kelloway (2014) also conduct an expert review to create a 37–point scale of serendipity in digital environments, and used the analysis of variance approach to explore the first set of findings, in which 107 university students assessed tools according to the five facets of serendipity listed above. Their findings helped them to refine their scale, particularly for the facets "Trigger-Rich" and "Highlights Triggers" in preparation for future studies on the topic.

Other studies of serendipity in digital environments focus on how best to capture these experiences, which are most often collected in the form of self-reports (Makri et al., 2015). Makri et al. (2014) interviewed 14 creative professionals about their personal strategies for influencing serendipity, and then discussed the various ways that digital environments support these strategies. For example, one strategy included was "varying their routines", which the authors suggested that designers of digital environments support serendipity by suggesting access to material tangentially related to their work, or by encouraging people with similar interests to share links. They concluded that digital environments that support these various serendipity strategies would be more beneficial to both creative professionals and general users because they would support elements of serendipity, rather than attempting to offer "serendipity on a plate" (Makri et al., 2014, p. 2181).

In a more recent study, Makri et al. (2015) returned to the observation of serendipity, claiming that "with a carefully considered approach, serendipity-related information interaction behaviour can be directly observed" (p. 1). Their approach included asking three sets of participants to use three different information environments to perform an information-seeking task of their choice. Their participants performed the task in an office, where they were asked to think aloud during the their search for information and

to bookmark relevant sites. They then answered questions about the process and the sites they had saved which provided the data for the study. The authors concluded that most of the sites the participants considered useful were made by recommendation systems, and that digital environments such as library web sites might consider broadening their reader recommendations to include those by the same author or with similar citations to the one the user is viewing (Makri et al., 2015).

The literature review above shows there are a number of methods of analysis available to study this phenomenon. It also makes apparent the lack of studies done on a single population's experiences with serendipity (with the exception of Makri et al 2014). In order to demonstrate the reason for selecting historians as the target population for this study, the following section will provide the background on historian's experiences with serendipity in the digital environment.

4.2   Literature Review - Historians on the Web

"Historians", wrote Roy Rosenzweig in 2003, "may be facing a fundamental paradigm shift from a culture of scarcity to a culture of abundance" (2003, p.739). Rosenzweig, the distinguished historian and director of the Center for History and New Media, was commenting on the massive amount of materials that future historians would have to deal with, once digitization processes and the Web made it possible for 'everything' to be preserved. Rosenzweig was far from alone in his concerns that scholars might not be able to wade through the sheer amount of material online, though he was one of the first to bring these concerns to the attention of historians. Many of his concerns are echoed in Leary's (2005) "Googling the Victorians", detailed in the introduction to the present paper.

Since the time of Rosenzweig's article, the changes to historical practice brought about by the use of digital technologies and the Web have become the topic of books, articles, blog posts, and websites, some of these being authored by Rosenzweig himself (Cohen & Rosenzweig, 2006; Roland & Bawden, 2012; Rosenzweig, 2006; Turkel, Crymble, & MacEachern, 2009). As recently as 2014, in a book written live on the Web to encourage public participation, the authors of *The Historian's Macroscope* note: "Historians are

collectively witnessing a profound transformation in how they research, write, disseminate, and interact with their work" (Graham, Milligan, & Weingart, 2014, p. 3). These transformations include working with large-scale data sets, creating visualizations, topic modeling, and data mining, amongst others.

These transformations are easy to see if one explores books on the topic. The aptly titled *Digital History* explored what happens when the internet becomes a part of a historian's toolkit (D. J. Cohen & Rosenzweig, 2006). In this book Cohen and Rosenzweig aimed to answer some of the questions that the latter framed in his 2003 article, in particular the questioning of the basic goals and methods of the historical craft (73). *Digital History* sets the stage for two digital textbooks, specifically designed to help historians become comfortable working with digital resources and be capable of seeing what 'Big Data' can tell them. The first of these, *The Programming Historian*, is a digital humanities handbook (Turkel et al., 2009). The first edition (2009) focused on the historian's ability to manipulate data using the Python programming language. Since then, it has become an interdisciplinary website where authors can contribute lessons on a variety of subjects, such as Data Management, Web Scraping, and building exhibits with Omeka (Crymble, et al., 2016). The popularity of this volume speaks to the growing interests of historians, and various ways they are working with material from the Web. The second book, *The Historians' Macroscope* (Graham et al., 2014), focuses on various methods for analyzing historical Big Data. Graham et al. see the tools and methods they present in their book as only part of the historian's toolkit, and see their work as building upon that by Cohen and Rosenzweig (2006), and Turkel et al. (2009). The authors state that not every historian will want to work with digital sources, or be interested in Big Data, but those digital historians, rather, will become, like oral or cultural historians, "part of the disciplinal mosaic" (p. 3).

As the works mentioned above have made clear, the digitization of sources and the shift to working in a web-based environment bring with them changes to the traditional research habits of historians. The working environments that these scholars inhabit are changing, from the library or archive to their computer desktop or tablet, and the way they interact with material is therefore being altered to suit that environment. Where once

these scholars browsed in the library stacks and archive drawers, they now use keyword searches and programming languages to find the information they seek. This has profound implications on various stages of their research practice; in particular, as has been shown in the literature, on the ways they discover and make connections between materials (Dalton & Charnigo, 2004; Nygren, 2014). As demonstrated in the introduction and in previous papers (Martin & Quan-Haase, n.d.-a, 2013) serendipity is an experience common amongst historians (Dalton & Charnigo, 2004; Hoeflich, 2007; Martin & Quan-Haase, 2013; McClellan III, 2005). Their desire to experience serendipity is commonly associated with browsing physical material, and has been shown to be one reasons that some historians have been reluctant to adopt digital technologies (Martin & Quan-Haase, 2013). Still, other historians have argued that the digital realm affords new opportunities for serendipity, that would not have been possible prior to the development of the Web (Solberg, 2012). For Solberg (2012) it is important that historians are aware of their own role in shaping the technology that they use. The "critical awareness" Solberg calls for is not unlike the "curatorial intelligence" deemed necessary by Fyfe (2015): historians need to maintain "an awareness and dialogue around digital tools, and not treat [...] digital search and discovery activities as transparent, neutral, or inconsequential to the acts of invention and interpretation" (Solberg, 2012, p.60). Understanding the role that serendipity plays in historians' information environments is a part of this dialogue. The questions remain: whether physical and digital environments lead to similar serendipitous experiences, if the two experiences are held in the same regard by historians, and if they offer the same benefits to historical research.

4.3   Methods

4.3.1   Online Survey

In our previous study where we conducted interviews with historians, and found that it was difficult to recruit participants (Martin & Quan-Haase, under review, 2013). In order to increase our sample size, we decided it best to create an online survey that would allow historians to answer our questions in fewer than 15 minutes, at a time convenient to them. One section of this survey, investigating how historians define and experience serendipity, is the topic of another paper (Article Two). Online surveys have the benefits

of being convenient to the participant and timesaving to the researcher (Evans & Mathur, 2005; Sax, Gilmartin, & Bryant, 2003). However, there are also downsides to online surveys, such as a lack of response from non-internet users, and privacy and security issues (Evans & Mathur, 2005). As we were particularly interested in the research habits of digital historians, we decided that the use of an online survey was justified and distributed the survey access link to our population via social media, listservs, and emails to history departments across Canada. On Twitter, there is a large population of historians that follow the hashtag #twitterstorians, and we used this to draw attention to our survey. To reduce any concerns over privacy and security we used Qualtrics for survey design and data collection, as this system does not rely on cloud-based data storage. Although we collected demographic information from our participants, no names were collected in order for the responses to remain anonymous. We obtained ethics approval (see Appendix D) and the survey was live from February through April 2015, during which time the primary researcher did weekly checks to ensure our population was increasing, and there were no cases of intentional misuse.

4.3.2   Demographics

There were four sections to the survey: Section A: participant research, Section B: serendipitous experiences with research, Section C: serendipitous experiences in digital information environments, and Section D: demographics. The full survey is available in Appendix B. A total of 142 participants started the survey, but only 90 participants provided answers to all of the questions (N=90). We did not require that the participants answer all of the questions, as only those who could recall a specific serendipitous experience were able to answer some of the questions. Also, several of our questions were open-ended, and required more time and effort than simply clicking a button, which may have influenced question non-response (Reja et al., 2003). As the numbers of respondents to each question will differ slightly due to the nature of the survey, we will report the number of participants (n) when discussing each question.

Demographics were collected at the end of the survey, and were completed by 88 participants (n=88). Of the historians who participated, 55% self-identified as female, 42% as male, and 1% as other, with 2% preferring not to answer. The ages of the

participants were fairly well spread out, with 9% between 18–24, 33% between 25–34, 23% between 35–44, 17% between 45–54, 11% between 55–64, and 7% aged 65 or older. The majority of participants held a PhD (49%), while 36% held a Master's Degree, 9% held an undergraduate degree, and 5% had completed high school (1% preferred not to answer). At the start of the survey we asked participants to choose their historical area of research from a list, and provided room for an 'other' option. The results (n=137) can be seen in Figure 11.
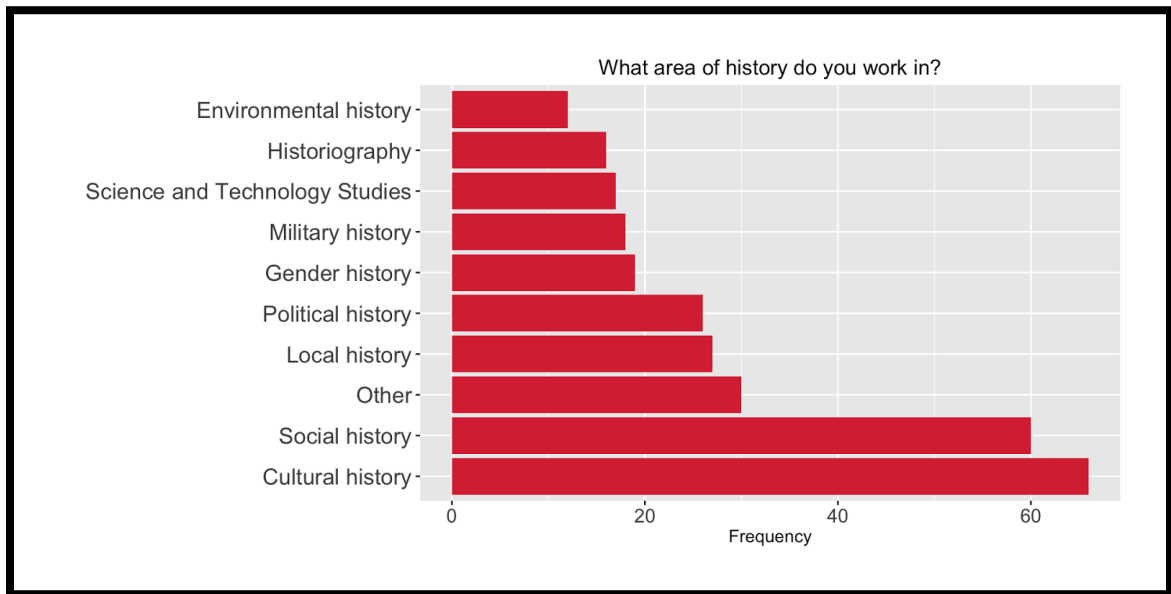
Figure 11 Areas of History studied by Participants

4.3.3   Descriptions of quantitative analysis

As the results reported in the current paper are preliminary in nature, there remains much work to be done with the quantitative results from the survey (See section on Future Work below). For the purposes of this paper, the quantitative answers were modeled in R. An attempt to use Fisher's test of independence to examine those who described themselves as digital historians against their experiences with serendipity showed no statistical significance. The low response to the survey resulted in us not being able to show statistical significance for this population. Therefore we provide the quantitative results here purely for description of the participants' experiences with serendipity in

various environments. Three questions on the survey (Q20, Q22, and Q24) are McCay-Peet's (2013) questionnaires for the "direct measure of serendipity".

4.3.4   Descriptions of qualitative analysis

The majority of the open-ended questions which required lengthy responses were reported in a previous paper (Article Two). However, participants were also asked to use their own words to follow-up on some of the quantitative questions that reported on their experiences with serendipity in digital environments. These questions included listing three types of digital environments in which they experienced serendipity (Q19), as well as describing the features of a selected digital environment (Q21) and digital environments in general (Q23) that they felt were conducive to the serendipitous encounter. Content analysis was performed on the answers to three questions, and methodological details will be described below.

Q19. Please list up to 3 digital environments where you have experienced serendipity. Please be specific, for example, if this occurs on social media, please indicate the platform (i.e., Twitter).

For Q19 participants could respond with the names of 1, 2, or 3 digital environments where they had experienced serendipity. Seventy-nine participants listed a total of 194 digital environments, and these digital environments were then separated into the categories that historians had previously been asked to report their comfort with in Q18 (see Findings below for results of both of Q18 and Q19). Three additional categories ("Databases", "Archives", and "Ancestry websites") were added to this list after the first round of coding to ensure a proper representation of the historians' answers. The historians' answers were straightforward and, once these additions were made, clearly fit into one of the categories listed.

21. Please describe the features (eg., keyword searches, browsing options, interaction with others) of this specific digital environment that you find to be most conducive to the serendipitous encounter.

23. Please describe the features of a digital environment that you find to be most conducive to the serendipitous encounter.

The answers to Q21 and Q23 were more complex than the answers to Q18, so a deductive content analysis approach was decided upon because "the structure of analysis is operationalized on the basis of previous knowledge and the purpose of the study is theory testing" (Elo & Kyngäs, 2007). We used the previously established categories by McCay-Peet, Toms, and Kelloway (2014), who have performed extensive research into serendipity in the digital environment. Their five facets of a serendipitous digital environment (SDE) identified in the literature review above provided a starting place for the content analysis. To ensure that as many of the historians' responses as possible were included in the analysis, and it was important to remain open to other categories being created if the five facets of SDEs did not account for the majority of their answers. In the first phase, themes or phrases were used as the unit of analysis (Berg, 2005) and each of the historians' answers to Q21 were categorized into the five facets, with many answers being divided into multiple phrases and some phrases fitting into multiple categories. There were three repeated phrases that were so prominent in the responses to Q21 that we felt it was necessary to create separate categories for them. Two of them, "People", and "Heuristic Search", were created as sub-categories to "Enables Connections" and "Highlights Triggers", respectively.

The final category "Keyword Search" was somewhat problematic. As a result of the wording of Q21, in which we had decided to include examples "(eg., keyword searches, browsing options, interaction with others)", many of the participants had simply answered "keyword searches" in response to this question. It should be noted that the selection of these three options was not arbitrary: we referred back to our interviews with historians from a previous study (Martin & Quan-Haase, 2013) to find examples that historians gave of experiencing serendipity in the digital environment. Regardless, we felt that the participants may have been influenced by the inclusion of these options. To account for this, we created a category to separate them from the other answers. Any response that simply consisted of "keyword search" was coded into this category. If a participant expanded on their use of keyword search to show how it linked to serendipity,

or if they described ways that they used searching options to help facilitate serendipity, then their answers were entered into other categories. The final coding scheme is shown in Table 7.

Table 7 Final Coding Scheme for Serendipitous Features in a Digital Environment

CODES	DESCRIPTIONS	EXAMPLE
Trigger Rich	The digital environment is filled with a variety of information, ideas, or resources interesting and useful to the user.	"Provision of links"
Enables Connections	The digital environment exposes users to combinations of information, ideas, or resources that make relationships between topics apparent.	" I oftentimes am led to other websites or ideas "
Sub-code EC - People	Where the connection is made as above, but involves people as either the providers of information or the link to information.	"Networking with people working in similar fields with me."
Highlights Triggers	The digital environment actively points to or alerts users to interesting and useful information, ideas, or resources using visual, auditory, or tactile cues.	"@replies and link-sharing through RTs"
Sub-code HT - Heuristic Search	Same as above but search is involved, showing an agency on behalf of the historian	"the extent that a search can be narrowed by specificity"
Enables Exploration	The digital environment supports the unimpeded examination of its information, ideas, or resources.	"Browsing options, especially "nearby on shelf""
Leads to the unexpected	The digital environment provides fertile ground for unanticipated or surprising interactions with information, ideas, or resources.	"citations in other works to unfamiliar works/authors/researchers"
Keyword Search	Anytime the respondents include keyword search with none, or very little, description. This was a fault of my own, for including this option in the wording to Q21. Will likely be omitted for coding.	"keyword search with google"

After the categories were fully developed into the coding scheme, we re-coded Q21 and coded Q23 according to the same set of categories. Finally, we wanted to ensure reliability by showing that our study would replicable to others, and had a second coder conduct a content analysis with the coding scheme above. They coded 50% of each sets of responses. The intercoder reliability for Q21was found to be Kappa = 0.62. According

to Landis and Koch (1977) this score is at the lower end of "substantial" agreement strength. The intercoder reliability for Q23 was higher, at Kappa = .72, at the higher end of "substantial" agreement strength. This indicates that there is some room for clarification of the coding scheme we employed, so as to avoid any room for confusion between codes in future studies.

4.4   Findings

4.4.1   Digital historians, digital environments

After our participants completed survey questions that focused on serendipity, including describing a recent serendipitous experience (Article Two), they were asked a series of questions about serendipity in the digital environment. We wanted first to gauge how comfortable our participants were using digital tools in their research. We asked a straightforward "Yes" or "No" question, *Would you describe yourself as a digital historian?* (Q17) to which 48% of the participants answered "Yes" (n=87). Next we asked the participants if they had experienced serendipity in a) a physical library or archive, b) while researching on the web, or c) on a digital library interface. Figure 12 shows that, for these participants, serendipity is experienced more frequently in a physical library or archive that it is on the Web.

We then decided to test whether those who identified as digital historians were more likely to experience serendipity in a digital environment. Figure 13 is indicative of a trend towards digital historians experiencing serendipity more frequently in a digital environment. Serendipity is experienced more frequently on the open web than in a specific library interface, but this may also be due to scholars using the web and web based searches more frequently than library specific interfaces (Kemman et al., 2013).
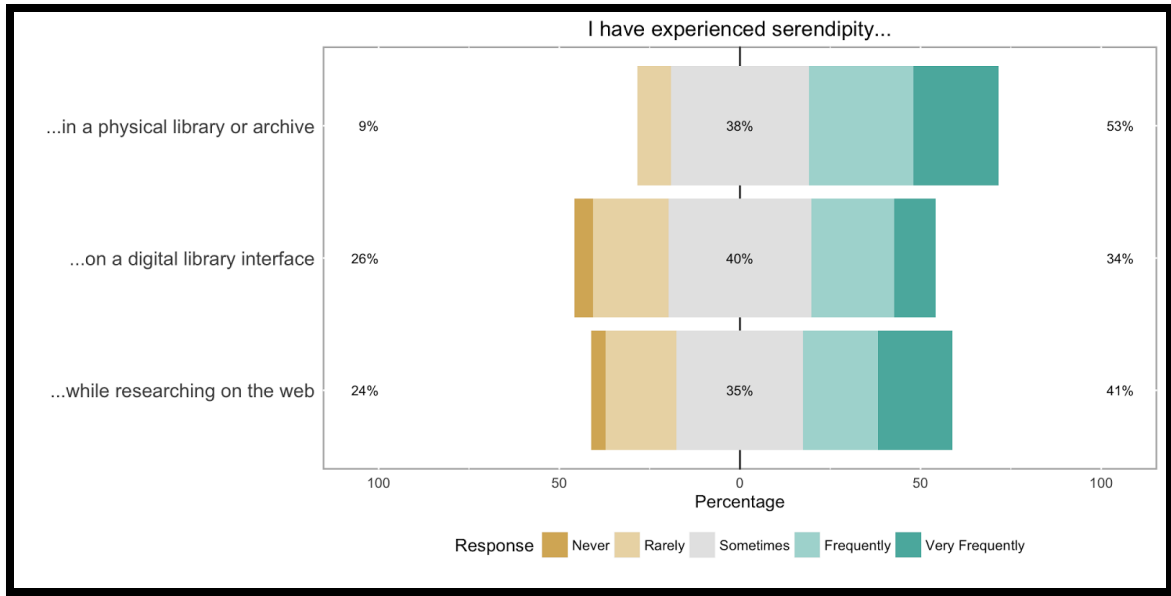
Figure 12 Environments where Historians Experience Serendipity
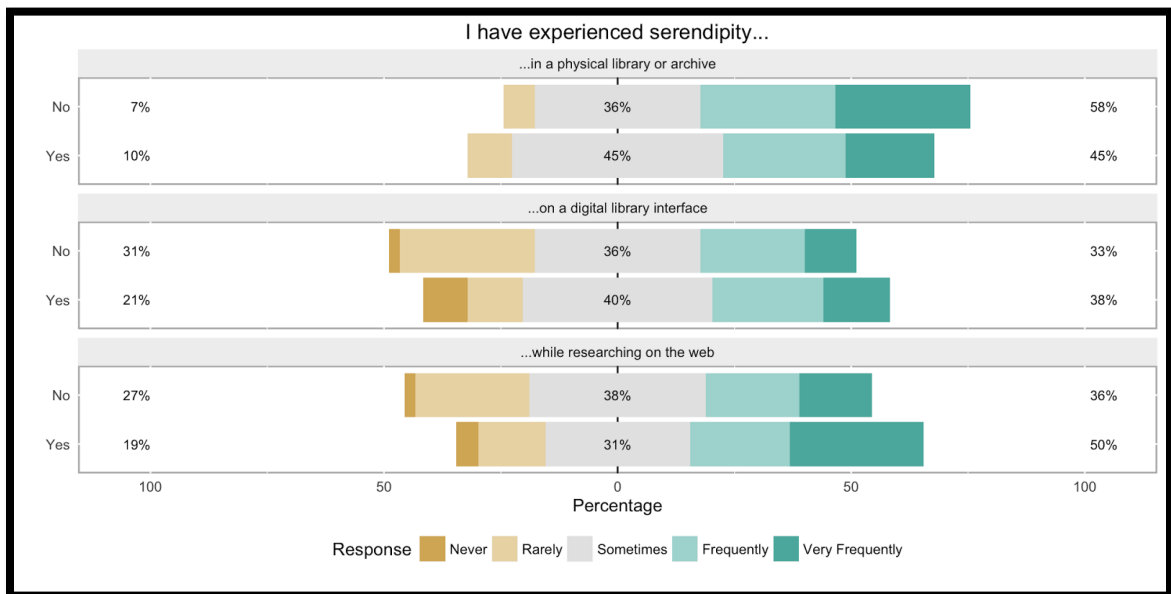
Figure 13 Environment where Digital (YES) and Non-Digital (NO) Historians Experience Serendipity

We then listed ten different digital environments and asked the historians to rate their comfort level with these environments on a five-point scale from Very Uncomfortable to Very Comfortable (Q18). Their results are shown in Figure 14. It is easy to see that the

participants were more comfortable with digital environments that they would come across as part of their working day, such as search engines, word processing tools, emails, and library interfaces. As the survey was conducted online and recruitment was partially done via Twitter, it is not surprising that the participants were also comfortable with social media. Historians were less comfortable with three other digital environments, Blogs, research tools like Evernote, or citation management tools such as Zotero, where 58%, 42%, and 59% of participants claimed to be either Somewhat or Very Comfortable. Finally, the two digital environments where the participants claimed to be the least comfortable were Writing Code or Software Development tools, where only 16% and 8% of our historians claimed to be comfortable.
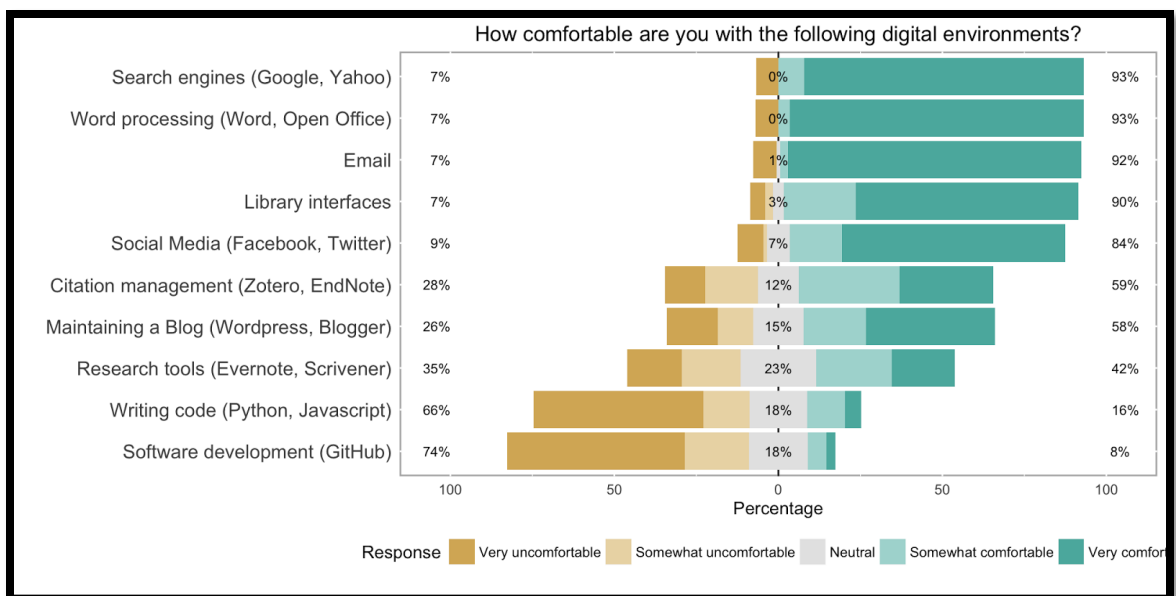
Figure 14 Historian's Comfort with Digital Environments

The answers to the question *Please list up to 3 digital environments where you have experienced serendipity* (Q19) resulted in a list of 194 digital environments. As the participants were not asked to rate these environments in any way, they were then coded according to the same ten digital environments as Q18, with the addition of three categories ("Databases", "Archives", and "Ancestry websites") to account for the digital environments mentioned by participants that fell outside of the original ten. The answers to Q19 can be seen in Figure 15. Social media is overwhelmingly the digital environment

most commonly named by historians as a place where they experience serendipity. While the answers to the questions regarding features of digital environments (section 1.4.3 below) support this finding, it should be noted that we used Twitter as one method of recruitment for this study, thus many of our participants are likely to feel comfortable using social media, and to use it frequently, possibly increasing their experiences of serendipity in this particular digital environment. Library interfaces, Databases, and Archives, are digital environments in which the historians also report experiencing serendipity. It is also likely that our participants seek information in the physical version of these environments, as many commented on using these digital environments in ways that mirror their use in the physical version. As we originally only included Library Interfaces in our list of digital environments, and later added Databases, Archives, and Ancestry Websites to account for the historians' own answers about where they experience serendipity, more work is needed to explore this breakdown of information environments and the experiences of serendipity in the digital and physical versions of each.
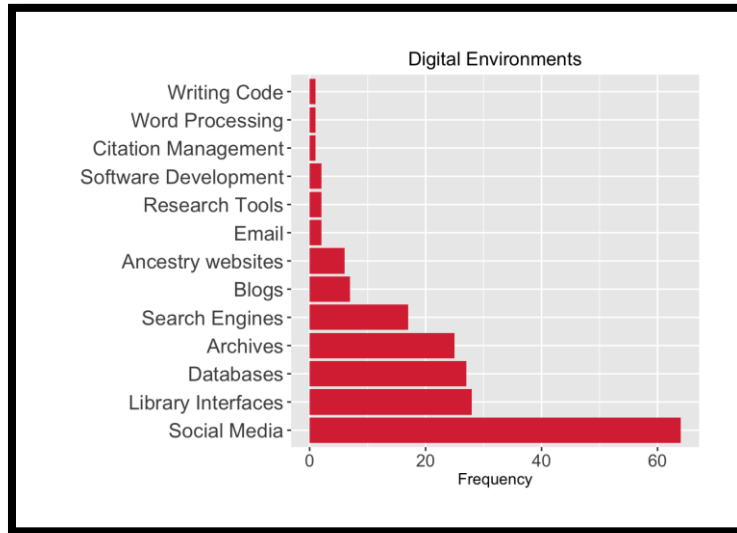
Figure 15 Digital Environments where Historians Experience Serendipity

Overall, though almost half of our population claimed to consider themselves "Digital Historians", and more of these participants experience serendipity while researching on the Web, many still experienced serendipity in the physical information environment.

Though the participants were largely comfortable using a variety of digital environments, including email, word processors, social media, and search engines, there are some digital environments, like software tools and writing code, that have not yet been integrated into the information tools of the majority of these historians.

4.4.2   The frequency of serendipitous experiences

Using the questionnaires to study the frequency of serendipity from McCay-Peet (2013), we asked the participants to answer the following set of four questions in regards to their experiences of serendipity in A) their first selection of digital environment in response to Q19, B) in digital environments in general, and C) in general, not just in digital environments. The answers to A and B were so similar that we decided to report on only B and C for the purposes of this study (the graphs for all three sets of responses can be found in Appendix H). The first set of responses, regarding experiences of serendipity in digital environments (n=80) is shown in Figure 16. These responses show that encountering
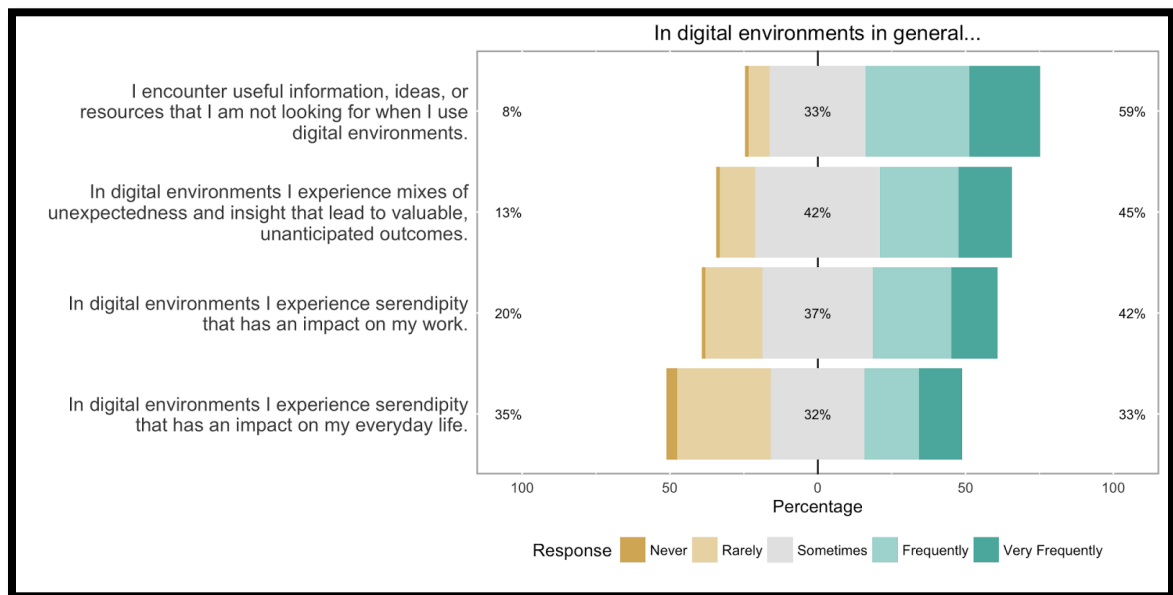
Figure 16 Experiences of Serendipity in Digital Environments

useful information while using digital environments is the most frequent response amongst our participants, who also tend to experience work-related serendipity slightly more often than serendipity that impacts their everyday life.

We then broke these answers down according to historians that answered "Yes" or "No" to Q17 (*Would you describe yourself as a digital historian?*) (Figure 17). Though a large percentage of historians selected "sometimes" as their responses to these questions, it was evident from Figure 18 that digital historians (those that answered "Yes") experienced serendipity more frequently while engaged in digital environments. Again, digital historians were more likely to experience work-related serendipity when using a digital environment, than they were to experience serendipity that impacts their everyday life, but this might well have been influenced by the nature of the questions on historical research they were answering throughout the rest of the survey.
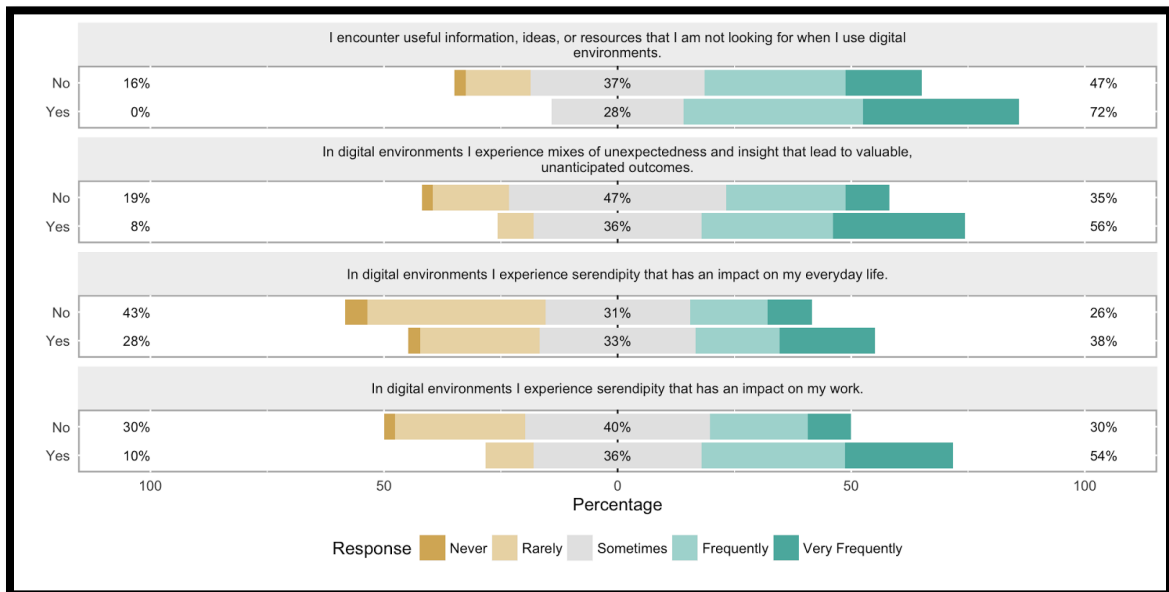
Figure 17 Experiences of Serendipity in Digital Environments for Digital/Non-Digital Historians

To further understand our population's experiences with serendipity, we then asked them to think about their life experiences in general (Q24), not just in digital environments. As

Figure 18 demonstrates, these responses are similar to the responses regarding the participants' experiences using digital environments.
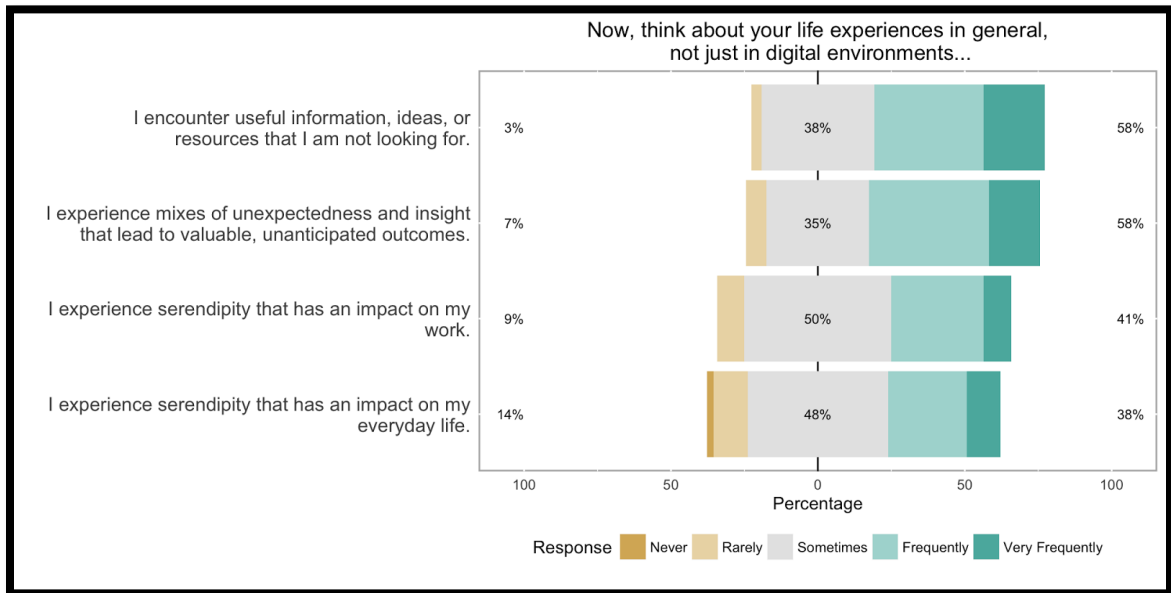
Figure 18 Experiences of Serendipity in General
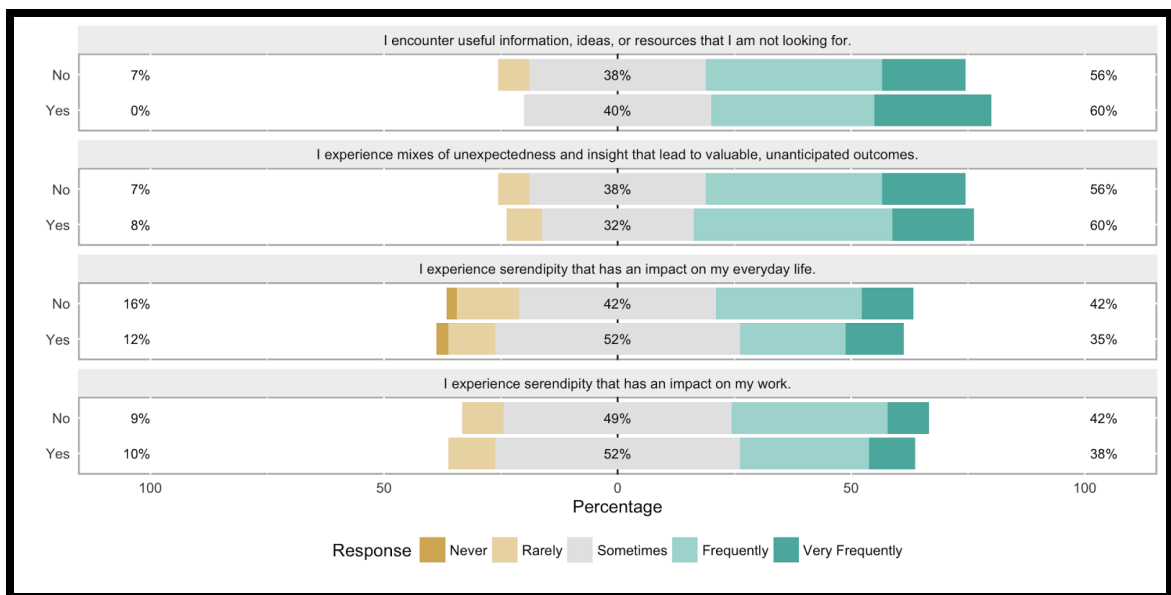
Figure 19 Experiences of Serendipity in General for Digital/Non-Digital Historians

However, when we broke these responses down into the "Yes" or "No" answers to Q17 (*Would you describe yourself as a digital historian?*) (Figure 19) the result was that both groups reported experiencing very similar frequency of serendipity across the four questions. In fact, very few historians claim to "Never" experience serendipity, with the exception of a small percentage that claim that this phenomenon has never impacted their everyday lives.

Overall then, despite our population reporting similar experiences with serendipity in their lives in general (online and offline), when it comes to using digital environments, the segment of the population that identified as digital historians were more likely to experience serendipity when working in a digital environment.

4.4.3   Features that support serendipity

After answering Q20 and Q22 (see previous section) the historians were asked to describe the features of a specific digital environment (Q21) and digital environments in general (Q23) that they felt were conducive to the serendipitous experience. These answers were in the form of a text box, and the questions were presented as follows:

 Q21 *"Please describe the features (eg., keyword searches, browsing options, interaction with others) of this specific digital environment that you find to be most conducive to the serendipitous encounter:"*

Q23 *"Please describe the features of a digital environment that you find to be most conducive to the serendipitous encounter."*

The content analysis performed on these answers involved five previously created categories of Facets of a Serendipitous Environment (SDE) from McCay-Peet, Toms, and Kelloway (2014) in addition to three categories developed through the coding process (see Methods for details). Table 8 shows the number of times each category was mentioned. Each of the features was mentioned in the historians' responses to both Q21 and Q23, to varying extents. Highlights Triggers, Enables Exploration, People, and Keyword Search were all prominent categories, though all eight categories were represented by the participants responses, showing that serendipity is an experience that

Table 8 Features of a Digital Environment that Support Serendipity

Features of a Digital Environment that Support Serendipity	Number of times mentioned in Q21 (n=72)	Number of times mentioned in Q23 (n=63)	Total Number of times mentioned
Trigger Rich*	2	4	6
Enables Connections*	8	10	18
Subcode EC – People	19	13	32
Highlights Triggers*	19	8	27
Subcode HT - Heuristic Search	7	10	17
Enables Exploration*	19	20	39
Leads to the Unexpected*	5	10	15
Keyword Search	25	13	38

* from L. McCay-Peet et al. (2014)

can occur in many different contexts, and that digital environments require multiple features in order to support serendipitous information behavior. The features are discussed individually below in detail, from the most common feature (Enables Exploration) to the least common (Trigger Rich).

Enables Exploration

Of the features that supported serendipity, there were three types that historians used to explore information. First, there were those related to browsing material on the web, either through the use of links available on blogs, websites, and in citations. Google was mentioned several times, with participants claiming to use the search results here to search like they would in a physical environment, as Participant 22 pointed out:

"I use Google and Google books like a library interface." (P22)

Second, historians also spoke about the relevance of linked open data and the semantic web to their research. Finally, historians claimed that exploring a full text primary source, particularly one that was previously unavailable to them, often resulted in finding new information.

Keyword Search

As outlined in the Methods section above, the high number of historians who mentioned keyword searching in their answers to Q21 and Q23 might have been due to our decision to mention this as an option in the wording for Q21. However, many historians expanded upon the reasons they found keyword searching to have serendipitous results. For example, Participant 52 claimed:

Keyword searches often bring up serendipitous results because they do are not confined to the usual 'silos' of archival references. They search across fonds and can bring up results from the entire archive, provided that enough is made searchable. (P52)

Thus, it is not so much the keyword search feature that results in serendipity, but the ability of the algorithm to gather material from different places and to cast a wider net than historians might be able to on their own.

People

Social Media was reported by the historians to be the digital environment where they most commonly experienced serendipity. For these folks, comments on blog posts, Facebook conversations, and connections their Twitter community often led to new insights. The historians largely recognized that they self-selected this community, and that they had interests in common with those who they followed, particularly on Twitter. For Participant 16, this was one way in which they could exert agency over their serendipitous experiences:

"It's a process of controlled serendipity: I follow people I'm interested in, for example, or start on a webpage that is key to my work. From there, I go on structured explorations." (P16)

We placed "People" as a sub-code under the heading of "Enables Connections" because historians spoke of people sharing information they could relate to, or having conversations with those in their field that inspired new ideas. Some of these phrases were also coded as "Highlights Triggers", but we felt it necessary to categorize the times that people were mentioned so as to demonstrate the prominence of social media amongst the historians' answers.

Highlights Triggers

For our participants, the most common way that triggers, or alerts to interesting or useful information, were presented in digital environments were as hashtags on Twitter. Hashtags are words used in social media digital environments that are include a "#" before them, such as "#History". Typing words this way turns them into links that allows users to click on them and see a list of current posts that include the same hashtag. Our participants noted how useful it was to be able to follow relevant hashtags, particularly around a conference they were interested in ("following conference hastags is helpful" P25) or debates by colleagues ("hashtags that help follow debates" P36). Other ways that digital environments highlighted triggers were recommendations presented with search results and links shared by others on social media.

Enables Connections

Digital environments that enable connections often presented our historians with new ways of looking at material. Word clouds, and other visualizations often enabled new associations between materials, as Participant 57 pointed out:

"_Interfaces that allow to see connections I wouldn't have thought of, like tag clusters. This seems to somehow recreate the effect of browsing the shelves or folders in a physical archive/library" (P57)_

Another 'feature' of digital environments that historians claimed lead them to serendipitous finds were the algorithms for keyword searches in tools such as Evernote or DEVONthink that showed you material around the term searched for, instead of just that specific term. Because these tools allow you to collect information from the Web and

beyond and collate it in one location, when historians search, they know the information is relevant in some way. The feature they enjoy is once again the algorithm for searching and presenting material, which, according to Participant 54 "shows you what's CLOSE to what you were looking for" and allows you to make connections from there.

Heuristic Search

Although they rely on the aforementioned algorithms to present information in meaningful ways, our participants also take it upon themselves to understand the tools they use in digital environments and learn to use them to their advantage, as Participant 64 indicated:

"I think that test digital tools once and once again and by different ways, you can know the tools, find how use it and, if it is possible, adapt it to your needs." (P64)

Search tools were, in particular, one method of information seeking in the digital environment that many of our participants were used to manipulating. Some mentioned constantly changing their search terms, or purposefully misspelling names and places they searched for in order to get a wider variety of results, and therefore having a greater chance of experiencing serendipity. Participant 13 demonstrated this:

"Key word searches are good, but you must be flexible with them and change the words until you get a strike. This is something like fly fishing." (P13)

Like historians do in physical libraries and archives, our participants use the digital tools available to them in ways that support serendipity in their research.

Leads to the Unexpected

The unexpected was a very common term in these historians' definitions and stories of serendipity (Martin & Quan-Haase, forthcoming). However, it did not feature prominently amongst the features of a digital environment that the historians felt supported serendipity. Although there were a few historians who mentioned having "illuminating, and occasionally serendipitous conversations" on Twitter that took them to unexpected places (P38), it was largely the results of a find or a conversation that lead

them in a new direction, not a feature that could be relied upon. It may have been difficult for the historians to think in terms of features that "Lead to the Unexpected" as users might not recognize that the digital environment is "fertile ground for unanticipated or surprising interactions" until after they have made a serendipitous connection (McCay-Peet et al., 2014).

Trigger Rich

Finally, we only found 6 references to digital environments that were "Trigger Rich", which were usually in passing, in phrases such as "Mostly just following hyperlinks" (P17). This does not necessarily mean that environments that include a lot of links to other material were not found to be serendipitous, because it seemed to us that these historians simply took for granted the links available on the Web, and only drew attention to them when they were in useful or unexpected places, such as links to citations in online Works Cited sections of journal articles. Twitter was another place that could have been classified as being "Trigger Rich", as the information on this site is constantly changing and links are provided here to other sources of information. However, here the historians predominantly mentioned the people they connected with through Twitter and how they followed conversations that interested them, rather than the preponderance of links available.

Overall, the five facets of serendipity in a digital environment (McCay-Peet et al., 2014) served well as a classification structure for the historians' responses to Q21 and Q23. While there was some difficulty with classifying features of digital environments under the facet "Trigger Rich", this largely stemmed from historians' immersion in the online world, and their taking pages with many links for granted. It must be noted that we used these categories as a coding scheme, which is different from how McCay-Peet et al. (2014) employ them in their studies. We felt that the authors had worked hard to discern these facets of serendipity, and had proven their connection to serendipity in the digital environment via concentrated statistical analyses. Our use of these facets in the present study was not necessarily to validate them in any way, but to use them as a framework for

guiding our understanding of serendipity in the digital environment, which also allowed us to remain open to the creation of sub-codes where necessary.

4.5 Discussion

This article details the findings of a preliminary analysis of historians' experiences with serendipity in digital environments. Our investigation of their comfort in digital environments demonstrated a large range – while many historians were comfortable with digital tools that they use in their everyday lives (email, word processing, social media) there were only a small percent of the participants who claimed to be comfortable writing code, or using software development sites such as GitHub. Over half the population were comfortable using citation management tools such as Zotero or Endnote, as well as maintaining a blog. If blogging and social media continue to increase the readership of academics (Cohen, 2006; Terras, 2012), the number of historians who become accustomed to working in this digital environments may continue to grow.

The variety of digital environments where historians worked was highlighted throughout our investigation of serendipity. Not only did participants describe themselves selecting their digital environment based on whether or not they felt it supported serendipity, but they also found various ways to make digital environments they chose to use more serendipitous for their research. For many this meant learning how to change their search terms to get fewer or more results, depending on their current need. A few participants mentioned that inputting incorrect search terms had previously led to serendipitous finds, and they had since started to do this as part of their own ways of supporting serendipity. In our previous paper, we use the term "heuristic" to describe "the various methods that historians used to support elements of serendipity in digital environments" (Martin & Quan-Haase, Under Review). The descriptions of the features of serendipity in the present study provide further detail about the ways historians are working to support serendipity in their digital research environments. This led us to coin the term "Heuristic Serendipity", which we define here as: *a process of information behavior in which historians use trial and error to create new, innovative methods of supporting serendipity throughout their research*. For the participants of our current study, this type of heuristic

serendipity usually took place on Google or on library interfaces, both digital environments in which participants claimed to be comfortable.

Our participants often spoke of wanting search results that were "close to perfect", but not necessarily limited to a single, correct answer. In order to create results of this nature historians have started to manipulate their search tools and other digital environments they use for research. There are two main ways that our participants indicated doing this. First, they tried out a variety of digital tools until they found what works for them. What digital environment they use, and how advanced the features are within it will obviously be impacted by their comfort and level of technological expertise. Some historians mentioned generating visualizations, which seemed "to somehow recreate the effect of browsing the shelves or folders in a physical archive/library" (P57), while others spoke of finding a research tool with an interface they prefer, which allowed them to keep their own personal database of research material. The second method of manipulating their search tools was to introduce flexibility into their searches, by including misspellings, wrong words, and different combinations of terms. Several historians also mentioned that faceted or advanced search options allowed them to encounter things that they considered unlikely in other environments. When they have obtained the results they were looking for, using either of the above methods of heuristic searching, the participants describe looking around this material in various ways. This form of information behavior was described much like other scholars have discussed browsing the stacks of a library (Björneborn, 2008; McKay et al., 2014): searching around material, browsing through search results, etc. It is this information behavior that enables heuristic *search* to become heuristic *serendipity*. This is where historians' own ability to connect-the-dots between historical research materials comes into play, and their recognition of useful, enlightening, or significant information can create a serendipitous experience. These skills are something that cannot be replaced by a single feature of a digital environment, which is one reason that historians are learning to control and manipulate these environments to suit their needs.

The frequency with which historians reported experiencing serendipity varied only slightly between their experiences in digital environments, and in their lives in general

(online and offline). Almost 60% of the population reported encountering "useful information, ideas, or resources" in both situations, while only 45% reported that in the digital environment they had experienced "mixes of unexpectedness and insight" that lead to a valuable outcome. The answers to these questionnaires (Figures 16 and 18 above) were somewhat problematic, as so many participants (up to 50% on one question) chose to answer "Sometimes" which is vague and difficult to interpret when we are already dealing with such a slippery topic. We also broke down the responses to the questionnaire regarding experiencing serendipity in the digital environment based on whether the participants had identified as a digital historian. Digital historians reported experiencing serendipity more frequently to each of the four questionnaires, indicative of a trend towards digital historians experiencing serendipity in digital environments (Figure 17). These results are preliminary, and much more work needs to be done to see how frequently serendipity is experienced in digital environments. Unfortunately, this is not an easy experience to measure. Future use of McCay-Peet's (2013) questionnaires may consider asking them with a list of particular digital environments in mind, perhaps after giving participants time to test each tool's usefulness for their research.

Finally, we asked our participants about the various features of digital environments that they felt supported serendipity. We found that there were a wide variety of features that historians found to support serendipitous experiences; some of them were features of the environments themselves, while others were the results of historians' heuristic serendipity. Four features were prominent: those that enabled exploration (by supporting links to other material, or having full text access available), those that highlighter triggers (such as hashtags on social media, or highlighted materials as suggestions), those that allowed for keyword searching (where historians could alter their search terms fluidly) and finally, those that connected them to other people.

Though we collected our data online, and social media was one method of recruitment, the number of times serendipity was connected to social media by our participants was remarkable. The role of social networks in the experience of serendipity has been highlighted in previous literature (Dantonio, Makri, & Blandford, 2012; McCay-Peet & Toms, 2010). Their investigation of historians led McCay-Peet and Toms (2010) to claim

that historians "relied on the expertise of colleagues and archivists to help them make associations and bisociations with the information" (n.p.). Where their participants largely interacted with their social networks in person, our historians were accustomed to interacting with theirs via the digital environment. The ability on Twitter to follow people and institutions that interested them or were relevant to their work led to what Participant 16 referred to as "controlled serendipity".

Control has featured in other studies of serendipity. Specifically in Foster and Ford (2003), who question the "controllability" of serendipitous encounters. Their participants largely stopped short of attributing control to their own experiences, choosing instead to "affirm uncertainty" where serendipity was concerned (p. 334). Our participants push ahead and refer to control when they describe their use of social media and its features to support serendipity. This element of control supports our findings in previous papers regarding the role of agency in historians' experiences with serendipity (Martin & Quan-Haase, under review). The OED defines agency as "ability or capacity to act or exert power" (Oxford University Press, 2015), which matches the historians' descriptions of "controlled serendipity". Their own choices about who to follow on Twitter, when to click on hashtag links, who to engage in conversation, or when to contact people who are recommended by Twitter's algorithm, all mean that they are exerting agency over the digital environment that so many of them found to support serendipity during their research process.

Dantonio et al. (2012) found that academics got the most out of Twitter when they were using it while taking a break from their research work, but our historians seemed to use the tool throughout their process, as a way of following along with conferences and engaging with other about their research. Participant 63 notes that it is the "constant flow of information" that helps support their serendipitous experiences. This use of Twitter aligns more closely with the serendipitous experiences that were reported in a study of Twitter use by Digital Humanities scholars (Quan-Haase, Martin, & McCay-Peet, 2015). These participants reported that the ubiquitous qualities of Twitter helped them to maintain awareness of new information in their research area. For our historians, it is not only the ubiquity of the Twitter interface, but also knowing that they exert control over its

features and functions that helps to support serendipity in this particular digital environment.

In the introduction to the current study we highlighted Fyfe's term "curatorial intelligence", which he claimed is needed by historians using the Web as an environment for research (Fyfe, 2015). He argues that serendipity has been "operationalized" by digital tools that take scholars down many different paths. However, our current study shows that these tools might not be doing all the work. Historians themselves are operationalizing serendipity, remaining aware of the multiple ways to access information and then exerting control over their digital research environments to make serendipity possible. Just as historians of the past were trained to use libraries and archives to their fullest extent, digital historians must now be trained with the "critical awareness" that Solberg (2012) calls for; they must continue to recognize the strengths and weaknesses of their digital environments in order to continue to be agents in their own experiences with serendipity.

4.6 Conclusion

The current paper examines the role that serendipity plays in the information practices of historians. It focuses on the digital environment, and draws conclusions from the analysis of responses to a recent online survey on Historians and Serendipity. Firstly, we found that historians are largely comfortable with digital environments, with almost half of our participants answering "Yes" when asked if they considered themselves to be a digital historian. Their comfort levels with specific digital environments do vary, with the majority of the historians who participated being quite comfortable with email and word processing, but much less so with programming languages and software development. It will be interesting to see how these comfort levels change in the future.

The frequency with which historians claim to experience serendipity in digital environments varied only slightly in the four questions we asked. Historians claimed to find "useful information" more frequently then they did "insights that lead to valuable, unanticipated outcomes", but so many historians answered "Sometimes" to these scale questions that we would require a larger population to gain further insights. However,

when we broke the participants down into digital and non-digital historians, the results were indicative of a trend towards digital historians experiencing serendipity more frequently in the digital environment.

To investigate the features of digital environments that historians felt supported serendipity, we employed the Facets of a Serendipitous Digital Environment from McCay-Peet, Toms, and Kelloway (2014), and supplemented them with three new codes as we developed our categories for content analysis. While the historians' responses were divided across the categories, there were three that stood out. Digital environments that Enabled Exploration, Enabled a Connection with other People, and Highlighted Triggers, or relevant material, were all shown to support serendipity. The majority of historians' responses regarding these features ranged across multiple categories, indicating that digital environments should have multiple features in order to support serendipity. Designers of digital tools can benefit from not only introducing features that support serendipity but by designing environments where historians can explore, and showing them how to create their own unique research paths through material.

This paper contributes to this field of research by showing the benefits of combining qualitative and quantitative methods to advance the understanding of serendipity. This combination of questions and analysis did much to add to our understanding of historians experience in digital environments. If it were not for our open-ended questions, we would not have obtained historians' opinions regarding what features of digital environments they thought supported serendipity.

4.7 Limitations

There were a number of limitations to the current study. Despite our efforts to recruit participants, we did not attain the number of historians to make our results generalizable beyond our population. Further statistical analyses need to be done on the survey results to further test the questionnaires created by McCay-Peet (2013) which measure the frequency of experiencing serendipity. However, the descriptive analyses completed as part of this study helped to show how digital and non-digital historians answer the questions that were part of this scale.

Also, though we did our best to let the historians speak for themselves, this is sometimes challenging in the survey format. While we were able to collect their opinions on features of a serendipitous digital environment, the categories to which they were allotted might not have been exactly as the historians would have responded if the question were phrased differently. This, however, is always a decision one has to make in survey design.

Finally, the decision to create and distribute a survey in a digital format means that we were limited to recruiting only historians that actively used either email or social media. While we were particularly interested in digital historians for the purposes of this study, this limitation likely meant there was some bias on behalf of the participants, especially where social media, one method of recruitment, was involved.

4.8   Future Work

Future work by the authors on this topic will include further integration of McCay-Peet's (2013) serendipity questionnaires, including a factor analysis of our findings to compare to the her more recent findings (McCay-Peet et al., 2014). Now that we have made a significant step in understanding how serendipity plays a role in historians' research processes, future work may include studies of other disciplines. Also, as this study benefitted from the knowledge of previous LIS studies on historians, using the results of the current study as a guide for future work on the use of technology by historians would help to show how historian's comfort levels with technology, and uses of digital environments, changes over time.

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5 Historians and Serendipity: Concluding Remarks

The three articles that make up this thesis unite two main bodies of LIS literature: the role of serendipity in research, and the information practices of historians. The intention of this thesis is to provide an understanding of serendipity as it is recognized, defined, and experienced by historians in both physical and digital information environments. The three papers report on a multi-method analysis, with Article One presenting a grounded theory analysis of 20 interview transcriptions, Article Two presenting a combination of grounded theory, content analysis, and narrative analysis of historians' responses to an online survey, and Article Three summarizing the quantitative answers on digital experiences of serendipity in the same survey. In the introduction to the thesis, three research questions (RQs) were presented to frame the study. Each of these RQs will be discussed below. Following that, I will outline the various contributions that this thesis makes to LIS literature, and the practical implications it may have for librarians, archivists, and historians. The final two sections discuss the limitations of the thesis, and areas for future work.

5.1 RQ1: How do historians experience serendipity in digital and physical information environments?

For the majority of historians who participated in our study, both the physical and digital environments were conducive to the experience of serendipity in their research. Each of these environments held different opportunities for serendipitous encounters with research material. The physical environment of the library was popular amongst our participants in Article One, possibly because of the other questions in the interviews that were associated with e-books, libraries, and information seeking. The historians felt the physical environment was conducive to serendipity because it allowed historians to: 1) browse; 2) place the items they were browsing in context; and 3) had an inherent organizational system that connected research materials by topic. In Article Two, physical environments also played a large role in historians' experiences of serendipity. Twenty-eight of the 34 serendipity stories collected as part of the surveys took place in a physical environment, most commonly in the archive, regarding the discovery of a primary source. It is necessary here to reflect upon the context in which the participants

gave these stories of serendipity. They were being asked about their historical work, the environments they work in and the materials they encounter *as historians*. For this reason, so many of the historians' stories taking place in an archive is not necessarily co-incidental, but is rather a reflection of what historians recall when asked to talk about their work. The archive is central to what a historian does, and to present an important memory from their historical research occurring in the archive is due in part to these scholars, though not necessarily intentionally, performing their identities as historians.[7]

These stories were collected as part of an online survey, and almost half of the historians who responded to this survey answered "Yes" when they were asked if they considered themselves a digital historian. In Article Three, we investigated how comfortable historians were in digital environments, and also asked them to describe the features of digital environments which they felt supported serendipity. Here we found that many historians were using digital environments like they did physical environments: they used keyword searches to find a specific piece of information, then browsed around that information in whatever way the environment allowed. For these historians, then, it was digital environments that had features that enabled exploration (such as hyperlinks or searchable full-text primary sources), and enabled connections (visualizations or research tools with algorithms that collate similar materials) were those that supported serendipity. Another finding about the digital environment was the prominence of social media in historians' serendipitous experiences. Twitter in particular was repeatedly noted as a digital environment where connections were made, leading to new insights. Features of social media tools that highlighted useful or interesting links, or triggers aided this connection to, and through people. On Twitter our participants noted this most commonly occurred via the use of hashtags, though they were also inclined to click on links shared or re-shared by people they followed. One participant referred to this experience as "controlled serendipity" (P16).

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[7] I am thankful to Dr. William Turkel for a discussion on this topic, and for the terminology regarding "performing identity" that I employ here and in the Discussion for Article 2.

As always there were participants whose experiences differed from the majority. In both the interviews and the survey responses, there were several respondents who had not experienced serendipity in the digital environment. They gave two related reasons for this: 1) they felt that the search results returned by digital tools were often too direct to allow for serendipity to occur, and 2) they were unable to place the digital or digitized sources into context, therefore limiting their ability to make connections between material.

In the responses to the interview questions for Article One, which took place between 2010 and 2013, historians were largely unaccustomed to working with e-books, and generally did not find digital environments conducive to serendipity. However, a few of them did indicate that they were using some of the search tools available from their library systems much like physical library shelves: browsing and picking up on material that was relevant to their research. We coded examples of this behaviour as Heuristic Serendipity, a name which we further developed and defined in Article Three as *a process of information behavior in which historians use trial and error to create new, innovative methods of supporting serendipity throughout their research.*

This heuristic serendipity can be understood as one way that historians' have responded to the digitization of both their sources, and their methods of access to and collection of research material: they actively pursue environments that can support serendipity, whether physical or digital. As the answers to RQ2 will demonstrate, historians are very much aware of the decisions they make in their research process, and how these choices impact their experiences with serendipity.

5.2 RQ2: How do historians understand the concept of serendipity as it pertains to their research?

For the historians interviewed and for those that participants in our survey, serendipity was an integral part of their research process. Though many of them claimed that their serendipitous experience with text, people, or information was unforeseen or unanticipated, the descriptions of these encounters taking place in the digital or physical environments had too much in common to be completely unexpected. Where previous

definitions of serendipity use the term "accidental" to describe the discovery of information (McCay-Peet, 2013, for example), we decided in Article One to employ the term incidental, and came up with the following definition: *The incidental discovery of valuable information related to historical research; often takes place in an organized information environment*. The term incidental was employed because historians described serendipity occurring as a result of their information behavior, and the training they received as part of their education.

After our analysis of the interviews from Article One was complete, we set out to discover how historians described and defined serendipity in their own words. We also needed to gain a larger population for our study, and wanted to focus on their experiences of serendipity in the digital environment and therefore decided upon an online survey as a means for satisfying both objectives. We asked historians to define serendipity (Q11), and then performed a grounded theory analysis during which we broke down their definitions into in vivo codes (words or phrases), and formulated seven categories that we termed Serendipity Components (SCs) from the list of codes. These components allowed us to look across the various definitions and contrast and compare their meanings. We later used these seven SCs to code the serendipity stories that the participants told as a response to Q14. This allowed us to eliminate one of the codes, "The Eureka Moment", which was only present in two of the 34 stories. Using the six serendipity components we derived the following definition from the words of the historians: *An unexpected encounter with useful or enlightening material, or information connected to the historian's previous knowledge. Commonly occurs during active historical research in libraries or archives, and fills a gap or creates new avenues of investigation*. This second definition of serendipity is more detailed, and closely links historians' experiences of serendipity with their common work environments. It also highlights the active role they play in this experience, which was described in both their definitions and in the serendipity stories they provided.

For historians, serendipity is a common occurrence, especially when experienced as part of their research process. The historians who participated in our study provided responses that clearly indicated that they were aware of and had thought through these experiences.

Although none of the participants went so far as to say that they expect or depend on serendipity to lend a hand in the library or archive, many of them *were* taking active roles in supporting serendipity in both their physical and digital environments.

5.3   RQ3: What lessons have we learned about how best to support serendipity for historians working in the digital environment?

Through both the descriptions of social serendipity and heuristic serendipity in Article Three, the participants in this study demonstrate that they are using features of digital environments that mimic or mirror the ways that they experience serendipity in the physical environment, a result that expands upon our own previous findings (Martin & Quan-Haase, 2013). Social serendipity sees historians talking to their peers online, using Twitter, Facebook or Blog discussions in ways similar to the ways previous studies have reported them discovering relevant information when talking to people at conferences, or through their work with archivists or librarians (Dalton & Charnigo, 2004; McCay-Peet & Toms, 2010; Stieg, 1981). Heuristic serendipity sees them using online catalogs and databases to locate a broad but related set of research material, much like what occurs when they browse the library shelves surrounding the book they originally searched for.

Several different digital interfaces have been created to reflect or represent the physical library. The Harvard Library Innovation Lab, for example, created *StackLife*, a visualization that shows a vertical shelf of books surrounding the one searched for, much like a library shelf. The shade of blue, thickness and length of the book signify the amount of times it has been checked out, its length, and its age, respectively (Innovation Lab, 2012). However, our results show it is not the visual cues that our participants desire (not to say that they hinder the search), but rather their ability to control and manipulate materials as they do in the physical information environment. Instead of digital environments being designed to mirror the physical, the users of these tools, in this case historians, will come to use the features of the environment in ways that are fitting to their research. For historians this means casting a wide net across the information landscape and being able to sort through and look around the information this net catches. Instead of creating systems that mirror the physical features of the shelves, librarians and

historians who want to support serendipity need to think of ways to support users' own abilities to make connections. There are several ways that our participants indicated this might be possible:

1. Supplying tools that support two specific stages of historical research: data collection and the writing process. (Article Two)
2. Developing tools that allow users to view their sources in their original context. This is particularly important when it comes to primary sources, as viewing items such as newspaper articles or genealogical materials in their original settings enables historians to make connections to surrounding materials, as well as the item they went under scrutiny. (Article One)
3. Interfaces that include links to tangentially related information. This might include hyperlinks throughout citation lists and web pages wherever possible, or the creation of information environments based on linked open data. Historians like to create their own research paths, to be able to pick things up and put them back down at their own discretion, not only when an interface brings them directly to a specific source. (Article One, Article Three)
4. Interfaces that support the user in engaging with research material in multiple ways. While Boolean Operators and faceted search options are a beginning, having the option to include simple visualizations that show multiple connections between materials would be beneficial. (Article 3)
5. Features that support the human capacity to remember. Make the research paths that the historians create retrievable. At the very least, create a system that remembers the last ten sites they have visited at the push of a button, so they can recount their steps when they hit upon something important. (Article 3)

5.4   Research Contributions

This thesis will contribute to the growing body of literature on serendipity, and to those who seek to understand the information practices of historians. Groups who will benefit from the three articles that make up this thesis include: Information professionals such as librarians and archivists, LIS scholars, and historians themselves. The benefits to these groups will be outlined below.

5.4.1 LIS scholars

This thesis contributes to a growing body of literature on serendipity in information behavior. It is novel in its use of qualitative and quantitative methods to understand how serendipity is experienced in a single population. The use of multi-method qualitative analysis in Article Two is novel, in that we used grounded theory to create a series of serendipity components based on the words and phrases used by this population, and then performed a narrative analysis which determined if the components were supported in the serendipity stories this population told. Only once we had shown that the components were widely experienced by our population did employ them we create a definition of serendipity as it is experienced by historians. This process allowed us to remain close to the data supplied by historians who responded to our survey, and, at the same time, to discuss the elements of these serendipity stories and why historians choose to use this method of storytelling. Other studies of serendipity could benefit from a similar analysis for different populations, both to see if their definitions of serendipity differ, and to contemplate the reasons those populations frame their experiences using serendipity.

Another important contribution this thesis makes to LIS is investigating the role of agency in the serendipitous experience. Though previous studies have linked control (Foster & Ford, 2003) and personality type (Erdelez, 1999) to experiencing serendipity, no study that I am aware of investigates a) the agency of the individual whose own decision making leads to serendipitous experiences, and b) the agency that material or information is given when these experiences occur. The present study looked at the use of active verbs to describe the historians' agency, and showed how this mirrored Bandura's (2006) four core properties of agency (intentionality, forethought, self-reactiveness, and self-reflectiveness). We also looked at the agency that historians assigned to "the find" or the object, or information through which serendipity occurs, arguing that the uncanny experience of giving agency to an object in either a library or archive creates an experience that matches Foucault's notion of heterotopia. These discussions of the role that agency plays in serendipity are only the beginning, and LIS scholars should consider ways of broadening this investigation.

5.4.2   Information professionals

Librarians and archivists that work in both digital and physical environments can benefit from the understanding of historians' experiences of serendipity that this thesis provides. Both digital and physical information environments were revealed to support serendipity in different ways, and both were shown to be important to the historical research process. This highlights the necessity of maintaining print collections of research material, as well as the development of digital environments that provide access to documents otherwise unavailable. This study has shown that historians like to create their own paths through research material, and that exploration and discovery is a large part of this process. While historians desire faceted search options, they also seek imperfect results that allow them to look around and make connections for themselves. Many historians have begun to use digital interfaces in ways similar to browsing the physical stacks, and librarians should take this into consideration when making selections regarding their website and other library interfaces.

5.4.3   Historians

As the population under study, historians are already aware of the role that serendipity plays in their research. This thesis would be useful for historians who are interested in studies of the historical research process, and in encounters with historical information in archives and libraries, both physical and digital. As noted by many historians to date, the Web is changing how many historians do their research (Fyfe, 2015; P. Leary, 2005; Rosenzweig, 2003; Solberg, 2012) and this thesis is one way that this population can maintain a critical awareness of the changes to their information behavior. As historians delve even further into the digital environment, creating more tools for historical research, or manipulating those that exist to suit their needs, they can make use of this study when reflecting on their own experiences with serendipity, and the changes that the future might bring to the stories they tell.

5.5   Limitations of the Thesis

As demonstrated in the current thesis and by several other studies, serendipity is an inherently difficult concept to study (Agarwal, 2015; Makri & Blandford, 2012). The

experience of serendipity is a subjective one (Iaquinta et al., 2008; Makri, Blandford, Woods, Sharples, & Maxwell, 2014; McCay-Peet, 2013), and where one person notices meaningful connections between research materials, another might not even pause to consider the same materials in their research. Being a subjective experience also means that, as researchers, we are dealing largely with the opinions of the populations we study, and have to take on the difficult task of bringing together these many, and often differing, opinions. We also elicit these stories of serendipity with the questions we ask: Serendipity is impossible to study as it is occurring, so we must ask questions to prompt our participants, which leads to re-interpretation of the past. Serendipity is also always studied in reflection, because until the positive outcome is derived from the experience, it cannot be considered as serendipity. This means depending on your subjects' memories as the material you study, and having to take into consideration the methods used to present and reflect on these experiences in hindsight.

There were several other limitations to the present thesis. Historians turned out to be a difficult population to recruit. It took us almost two years to attain interviews with 20 historians for Article One. It was for this reason that we decided upon a survey method for Articles Two and Three. The survey we developed, while quadrupling our number of participants, still remained too low a population to ensure our findings were generalizable. The questions that we included in this survey demonstrated the complexity of serendipity, for we were often left with as many questions as responses we received.

Finally, both methods of data collection we employed have their limitations. We wanted to conduct the interviews with historians in person, and this meant limiting our population to historians in Southern Ontario. While we managed to represent both men and women, and graduate students and faculty almost equally, the historians are certainly not representative of the discipline at large. The surveys were limited due to their digital nature. We recruited our participants entirely online, via email and social media. This meant we were able to capture the opinions of digital historians, our target audience for the survey, but also that we did not have access to a well rounded population of historians, including those that work exclusively in the physical environment.

5.6   Future Work

Although the popularity of research on serendipity is growing, there remains much work to be done. Future work on the topic of this thesis includes an examination of the features of digital environments that support serendipity reported in Article Three. Historians are only one discipline that are working in digital environments, and future studies may consider testing our findings with several other populations to see what features support serendipity across disciplines, and which are specific to certain populations.

The use of narrative analysis to break down and comprehend serendipity stories aided our understanding of what components of serendipity were important at various stages of research. Narrative analysis also created discussions around the audiences for serendipity stories, and how they are used to persuade various audiences of the importance of the historical find. This form of analysis is novel in terms of serendipity research, and future studies could benefit from using this approach to understand the information behavior of their specific populations.

Finally, there is a pressing need to assess the usefulness of digital tools, which are growing in abundance. The features highlighted by historians in Article Three have the potential to help assess whether digital environments support serendipity. While some studies of digital library tools have taken place (McCay-Peet, Quan-Haase, & Kern, 2014; Race, 2012), much work is left to be done to assess digital archives, databases, and ancestry websites, all environments in which our participants claimed to have experienced serendipity.

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Appendix A Interview Guide: Historians and E-Books

How familiar are you with Ebooks?

Very Familiar: Have you used an Ebook before?

Somewhat familiar: Have you used and Ebook before?

Not at all familiar: Have you heard of Ebooks?

If YES: In what context do you use them?

If NO: What do you know about Ebooks?

If YES: In what context do you use them?

If NO: What do you know about Ebooks?

Would you consider using them in the future?

What initially piqued your interest in Ebooks?

What initially piqued your interest in Ebooks?

Where would you go to find out more about Ebooks?

For those that have used Ebooks: Where did you first hear about Ebooks?

Has the media played a role in your adoption of Ebooks?

How do you find the media portrays Ebooks/Ereaders?

Have you ever used GoogleBooks?

Have you ever used an Ereader? Do you own one?

Have you seen one in operation? If YES: where?

For those who answered YES to using Ebooks:

If YES: How did you find the experience for yourself?

If NO: Would you consider doing so in the future?

How do you think students found the experience?

Why or why not?

For ALL: How do you think that using Ebooks can enhance the learning experience?

Do you think the purchase of an Ereader would be beneficial to students?

If YES: How so?

If NO: Why not? What problems do you foresee?

If it were an option to digitize your entire syllabus, would you consider doing so?

Would you consider publishing a book in Eformat?

If YES: What do you believe are the advantages of this?

If NO: Why do you prefer to publish only in print?

For those who answered YES to using Ebooks:

If YES: Can you tell me how you found this experience?

If NO: Is there a reason that you choose not to use Ebooks?

Have you considered how Ebooks affect your ability to find information?

Do you think it restricts or promotes chance encounters with information?

Appendix B Online Survey: Historians and Serendipity

Understanding Serendipity

This survey is being conducted as part of an investigation into the role of serendipity in the historical research process. Serendipity, or the chance encounter with research material, is an experience often recalled by historians when talking about their research. In the following survey, you will be asked to think back over your own work as a historian and answer some questions about the role that chance has played in your research. Feel free to leave blank any questions you prefer not to answer. There is a section for comments on the final page.
Thank you for your time.

In this first section, please tell us a little bit about yourself.

1. What area of history do you work in?

- ☐ Cultural history
- ☐ Military history
- ☐ Local history
- ☐ Political history
- ☐ Environmental history
- ☐ Social history
- ☐ Gender history
- ☐ Historiography
- ☐ Science and Technology Studies
- ☐ Other (Please name)

2. What is the geographical area and time period do you study (if any)?

3. Where do you do most of your research?

- ○ At work, in my office
- ○ At home
- ○ In a library or archive
- ○ Other (please indicate)

4. How often do you visit a physical library or archive?

- ○ Never
- ○ Less than Once a Month

- ⦿ Once a Month
- ⦿ 2-3 Times a Month
- ⦿ Once a Week
- ⦿ 2-3 Times a Week
- ⦿ Daily

5. What is the main purpose of your library or archive visits?

- ⦿ To obtain or access primary sources for my research
- ⦿ To obtain or access secondary sources for my research
- ⦿ To have meetings with other faculty or librarians
- ⦿ To write, research in private
- ⦿ To browse
- ⦿ Other (please explain)

6. How often do you engage in research related activities in a specified digital information environment? (ie., a digital archive, a virtual library interface)

- ⦿ Less than Once a Month
- ⦿ Once a Month
- ⦿ 2-3 Times a Month
- ⦿ Once a Week
- ⦿ 2-3 Times a Week
- ⦿ Daily

7. How often do you search/browse for information on the Web?

- ⦿ Less than Once a Month
- ⦿ Once a Month
- ⦿ 2-3 Times a Month
- ⦿ Once a Week
- ⦿ 2-3 Times a Week
- ⦿ Daily

8. Do you use social media?

- ⦿ Yes
- ⦿ No

9. If "yes", which social media platforms do you use?

- ☐ Twitter
- ☐ Facebook
- ☐ Linked In
- ☐ Google+
- ☐ Blogs
- ☐ Instagram
- ☐ Tumblr
- ☐ Pinterest
- ☐ Other (Please specify)

10. How often do you use social media? (Any platform)

- ○ Less than Once a Month
- ○ Once a Month
- ○ 2-3 Times a Month
- ○ Once a Week
- ○ 2-3 Times a Week
- ○ Daily

Chance encounters with information

This section of the survey will ask you about serendipity as you have experienced it throughout your research. Feel free to be descriptive in your answers and provide as much detail as you can about these experiences.

11. Please provide a definition of serendipity (as it pertains to historical research) in your own words.

12. Have you ever experienced serendipity during your research?

- ○ Yes
- ○ No

13. Please describe where in the research process you most commonly experience serendipity.(ex. While searching for a research topic, while writing a paper, while presenting at conferences, etc)

14. If possible, please describe a recent serendipitous experience that occurred during your research. Provide context in terms of what you were you doing, where and how did

serendipity occurs, what relevance did it have, etc. If you can't recall a recent experience, please leave blank.

14. Thinking back to this experience, did the chance encounter with information happen:

- ○ In a digital information environment (digital archive, library interface)
- ○ In a physical environment (in a library, in an archive)
- ○ While browsing/searching on the Internet
- ○ While using social media (Twitter, Skype)
- ○ Other (please explain)

15. Please answer the following questions with all of your previous experiences of serendipity in mind.

	Never	Rarely	Sometimes	Frequently	Very Frequently	I don't know
I have experienced serendipity in a physical library or archive	○	○	○	○	○	○
I have experienced serendipity on a digital library interface	○	○	○	○	○	○
I have experienced serendipity while researching on the web	○	○	○	○	○	○

Serendipity in the Digital Environment

The digital information environment, consisting of search engines, library interfaces, social media, word processing tools, etc, continues to change the way that scholars do their research. Within the field of history, there is a subsection of historians that call themselves 'digital historians' because of their reliance on computers to perform much of their analysis. The following set of questions seeks to understand the role that digital environments play in historical research, and what the role of serendipity is within these constructs.

16. Would you describe yourself as a digital historian?

- ○ Yes
- ○ No

17. How comfortable are you with the following digital environments?

	Very uncomfortable	Somewhat uncomfortable	Neutral	Somewhat comfortable	Very comfortable	I don't know
Word processing (Word, Open Office)	○	○	○	○	○	○
Email	○	○	○	○	○	○
Writing code (Python, Javascript)	○	○	○	○	○	○
Library interfaces	○	○	○	○	○	○
Search engines (Google, Yahoo)	○	○	○	○	○	○
Social Media (Facebook, Twitter)	○	○	○	○	○	○
Citation management (Zotero, EndNote)	○	○	○	○	○	○
Research tools (Evernote, Scrivener)	○	○	○	○	○	○
Maintaining a Blog (Wordpress, Blogger)	○	○	○	○	○	○
Software development (GitHub)	○	○	○	○	○	○

18. Please list up to 3 digital environments where you have experienced serendipity. Please be specific, for example, if this occurs on social media, please indicate the platform (ie., Twitter).

1)

2)

3)

19. Thinking about your first choice in the previous question, please answer the following questions:

	Never	Rarely	Sometimes	Frequently	Very frequently	I don't know
In the digital environment I selected, I experience serendipity	○	○	○	○	○	○

	Never	Rarely	Sometimes	Frequently	Very frequently	I don't know
that has an impact on my work.						
In the digital environment I selected, I experience mixes of unexpectedness and insight that lead to valuable, unanticipated outcomes.	○	○	○	○	○	○
In the digital environment I selected, I experience serendipity that has an impact on my everyday life.	○	○	○	○	○	○
I encounter useful information, ideas, or resources that I am not looking for when I use the digital environment I selected	○	○	○	○	○	○

20. Please describe the features (eg., keyword searches, browsing options, interaction with others) of this specific digital environment that you find to be most conducive to the serendipitous encounter:

21. Now, think about your experience in digital environments in general, not just the one you selected.

	Never	Rarely	Sometimes	Frequently	Very frequently	I don't know
In digital environments I experience serendipity that has an impact on my work.	○	○	○	○	○	○

	Never	Rarely	Sometimes	Frequently	Very frequently	I don't know
I encounter useful information, ideas, or resources that I am not looking for when I use digital environments.	○	○	○	○	○	○
In digital environments I experience serendipity that has an impact on my everyday life.	○	○	○	○	○	○
In digital environments I experience mixes of unexpectedness and insight that lead to valuable, unanticipated outcomes.	○	○	○	○	○	○

22. Please describe the features of a digital environment that you find to be most conducive to the serendipitous encounter.

23. Now, think about your life experiences in general, not just in digital environments.

	Never	Rarely	Sometimes	Frequently	Very Frequently	I don't know
I experience serendipity that has an impact on my everyday life.	○	○	○	○	○	○
I experience serendipity that has an impact on my work.	○	○	○	○	○	○
I encounter useful information, ideas, or resources that I am not looking for.	○	○	○	○	○	○
I experience mixes of unexpectedness and insight that lead to valuable, unanticipated outcomes.	○	○	○	○	○	○

Demographic Questions

24. What is your age?

- ⚪ 18-24
- ⚪ 25-34
- ⚪ 35-44
- ⚪ 45-54
- ⚪ 55-64
- ⚪ 65-74
- ⚪ 75 or older

25. What is the last degree you obtained?

- ⚪ High school diploma
- ⚪ Undergraduate degree
- ⚪ Master's degree
- ⚪ Doctoral degree/PhD

26. What is your gender?

- ⚪ Male
- ⚪ Female
- ⚪ Other
- ⚪ Prefer not to answer

27. Comments. Please feel free to add any comments about the survey here. If you have questions for the researchers, please email _____@gmail.com. Thank you for your participation.

Survey Powered By Qualtrics

Appendix C Ethics Approval #FIMS2010-014 R4

Ethical Review of Research Involving Human Subjects

All non-medical research involving human subjects at the University of Western Ontario is carried out in compliance with the Social Sciences and Humanities Research Council Guidelines (2002). The Faculty of Information Media Studies (FIMS) Research Committee has the mandate to review FIMS student research proposals for adherence to these guidelines.

2011 – 2012 FIMS Research Committee Membership

1.	R. Babe		7.	A. Pyati
2.	A. Benoit		8.	A. Quan-Haase
3.	J. Burkell (alt)		9.	D. Robinson
4.	E. Comor		10.	K. Sedig (alt)
5.	C. Hoffman		11.	L. Xiao
6.	P. McKenzie (Chair)*			

Research Committee members marked with * have examined the 3rd revision (**FIMS 2010-014R4**) to your approved research project FIMS 2010-014 entitled:

A Digital Lens for Looking at the Past: Exploring the Possibilities of the Electronic Book amongst Faculty and Students of History

as submitted by: Anabel Quan-Haase (Principal Investigator / Supervisor)
Kimberly Martin (Co-investigator / Student)

and consider it to be acceptable on ethical grounds for research involving human subjects under the conditions of the University's Policy on Research Involving Human Subjects. Approval is given for the period **November 2, 2011 to December 31, 2012**.

Approval Date: November 2, 2011

FIMS Research Committee Chair

240 North Campus Building, The University of Western Ontario, London Ontario N6A 5B7

Appendix D Ethics Approval NMREB #106351

Western Research

Research Ethics

Western University Health Science Research Ethics Board
NMREB Delegated Initial Approval Notice

Principal Investigator: Dr. Anabel Quan-Haase
Department & Institution: Information and Media Studies\Faculty of Information & Media Studies, Western University

NMREB File Number: 106351
Study Title: The Role of Serendipity in the Research Process of Historians
Sponsor:

NMREB Initial Approval Date: March 30, 2015
NMREB Expiry Date: March 30, 2016

Documents Approved and/or Received for Information:

Document Name	Comments	Version Date
Recruitment Items	Recruitment methods and details.	
Revised Western University Protocol	Revised Ethics form #106351	2015/03/03
Revised Letter of Information & Consent	New version of information letter - clean	2015/03/03
Instruments	Revised Survey Instrument	2015/03/03

The Western University Non-Medical Research Ethics Board (NMREB) has reviewed and approved the above named study, as of the NMREB Initial Approval Date noted above.

NMREB approval for this study remains valid until the NMREB Expiry Date noted above, conditional to timely submission and acceptance of NMREB Continuing Ethics Review.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario.

Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB.

The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.

Ethics Officer, on behalf of Riley Hinson, NMREB Chair or delegated board member

Ethics Officer to Contact for Further Information

This is an official document. Please retain the original in your files.

Appendix E Recruitment Letter for Survey Participants

For the past several years, my research as a PhD student in Library and Information Science has allowed me to delve into the information behavior of practicing historians. I've studied their use of technology, of both the physical and digital library, and their communication behavior. I've published on their awareness and knowledge of e-books, and am now looking to develop one section of the findings from that paper into my thesis.

I am currently seeking practicing historians and history students to complete an online survey that should take about 15 mins. The survey investigates the role that serendipity (or that "A-ha!" moment) plays in historical research. There are four sections to this survey: Section A - the participant's own research, Section B - the participants' serendipitous experiences with research material, Section C - serendipitous experiences as they occur in the digital information environment, and Section D - demographics. All participants will remain anonymous.

You can participate in the survey by clicking here:

http://tinyurl.com/lm47wxo

Please email any comments or questions to Kim at

Looking forward to hearing from you!

Kim Martin

Appendix F Areas of History Studied by Participants

1. What area of history do you work in?

#	Answer		Response	%
1	Cultural history		66	48%
2	Military history		18	13%
3	Local history		27	20%
4	Political history		26	19%
5	Environmental history		12	9%
6	Social history		60	44%
7	Gender history		19	14%
8	Historiography		16	12%
9	Science and Technology Studies		17	12%
10	Other (Please name)		30	22%

Other (Please name)

Labor history
Litigation Support
Religious History
Religious History
Indigenous
Public History
Economic History
Medical
Indigenous
Religious
Digital History
Economic History
Economic history
Religious history
Urban and hospital history
urban history
Imperial
Biographical history
Medical
religious
History of the Emotions
Education History
Sport
Genealogy
family history
Ancient History
book history
Museum
history teacher
Economic history

Appendix G List of In vivo Codes assigned to Serendipity Components

The 'Un'-factor	Eureka moment	Active Research Methods	Descriptions of the find	What the find does	Location of material	Connection
unexpected(27)	revelation	coming across	tailor made	opens the door	archival (3)	pattern seeking
unintended (2)	becomes obvious	stumbling (15)	exactly what I need	a conclusion never considered	not properly indexed	link
coincidence	starts to make sense	using	right piece	answers a question	library	correlation
unanticipated	realized	exploring	perfect	filling a gap	near known sources	combination
elusive	sparks	searching	pertinent	proving inaccuracy	shelf browsing (5)	related
slipped through fingers	discovery (9)	planning	need	sheds new light	home shelves	tangential
forgotten	lightbulb	buying	important	new ideas	not tagged	juxtaposition
unknown	a-ha	hoping	a gem	deepens understanding	Dewey	connection
overlooked	event	unfolding	valuable	impacts	document	related information found
surprise (4)	happy occasion	hunting	fruitful	new directions (2)		interest (4)
unexpected place (4)		happening	useful (5)	perspective (2)		also of interest
did now know existed		capturing	delightful	new areas (3)		directly or indirectly related
unthought of		running into	positive	changes		pieces
rare		actively creating conditions	happy	demystifies		connects
unforeseen		looking (6)	fortunate	elucidates		relevant
unplanned action		research route	primary (6)	cracks open your understanding		
accidentally (5)		right time	digital (7)	changes my		

				vision of the subject		
weren't looking for		process	good	enriches my comprehension		
random (2)		hypothesis	interesting	gives me other paths of research		
little/no effort		pursuing understanding	examples	makes a world of difference		
not consciously		brushing up	enlightening	radically shifts research forward		
unrelated information found (11)		the case you are building	voluminous	speaks to a part of your research		
chance encounter (18)		being aware	compelling	positive impact on research		
info came my way		wonder	consequence	radically changes		
happenstantial		read	the fruit of research	opens the way		
luck		months or years of research	delightfully distracting	sends you off		
		finding (34)		satisfying manner		
		studying				
		seeing				
		thinking				
		consider				
		creative				
		prepared to recognize				
		having a feeling				
		being open				
		making the most of it				

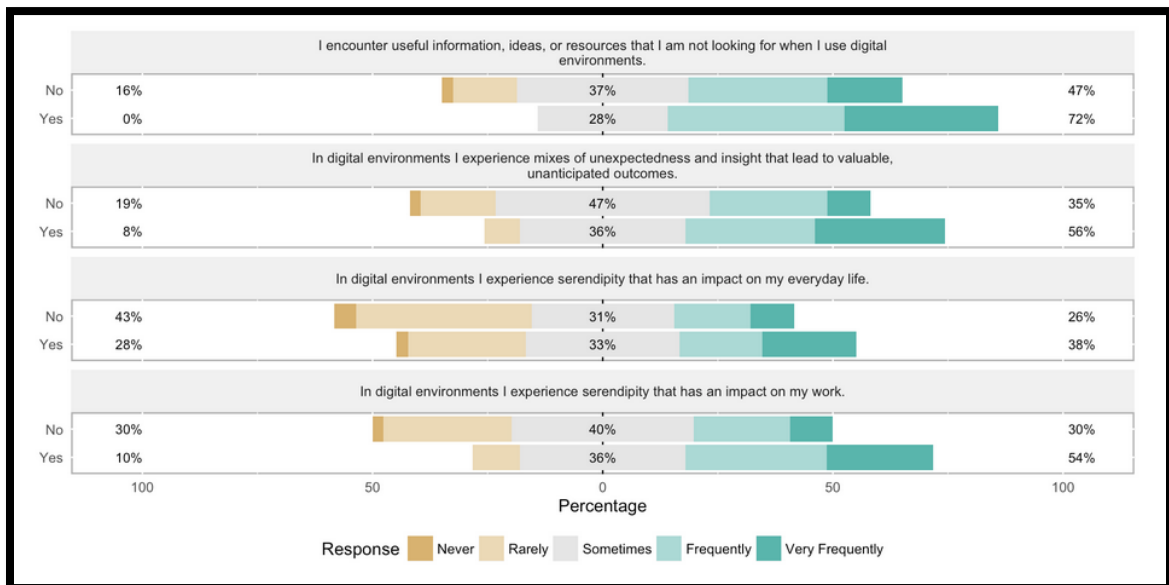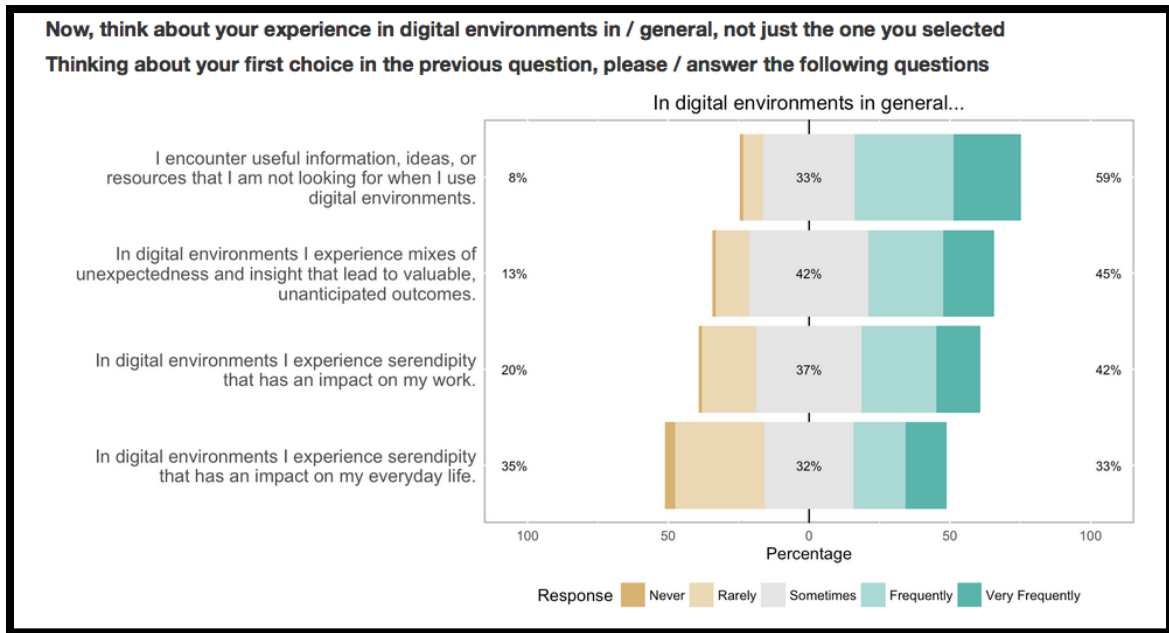|		thinking out loud				
		examine				

Appendix H Historians' Responses to the Direct Measures of Serendipity Questionnaires

As noted in the text, we integrated McCay-Peet's (2013) questionnaires into our survey on Historians and Serendipity. The following graphs show the findings for A) the digital environments that the historians' selected as supporting serendipity, B) digital environments in general, and C) serendipity in general, not just in digital environments. Once this analysis was visualized, we decided to break it down into two groups: the historians who answered "Yes" to considering themselves a digital historian (represented in the "Yes" category on the Y axis in the bottom charts) and those who answered "No" to the same question (represented as "No" on the Y axis). As the results were similar for both A and B, we chose not to include them in the body of Article Three, but to include them here for comparison and clarity.
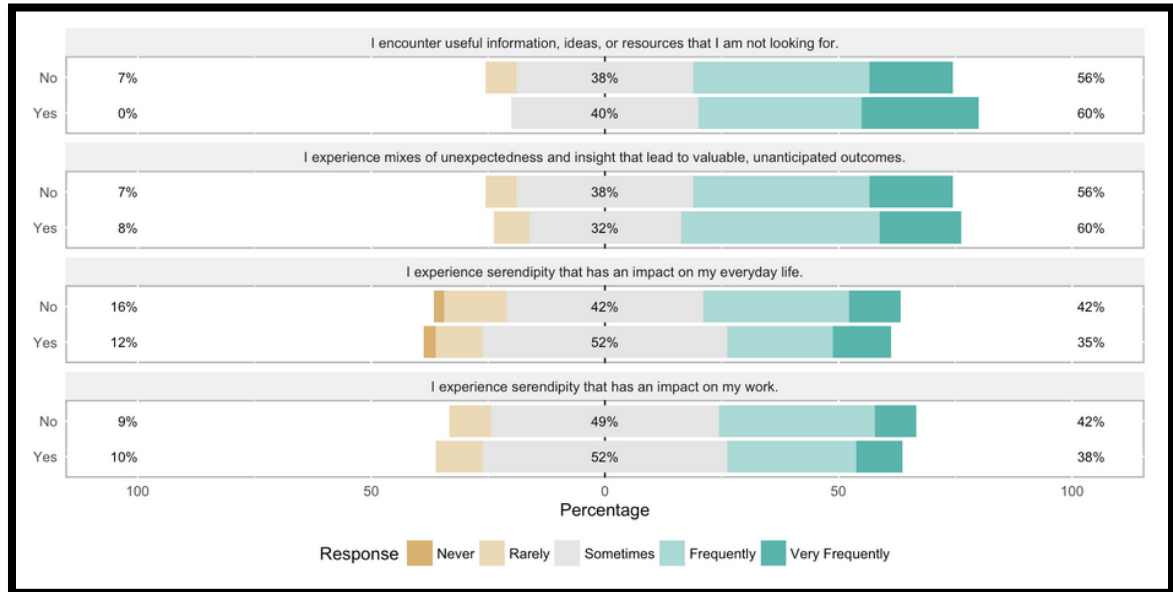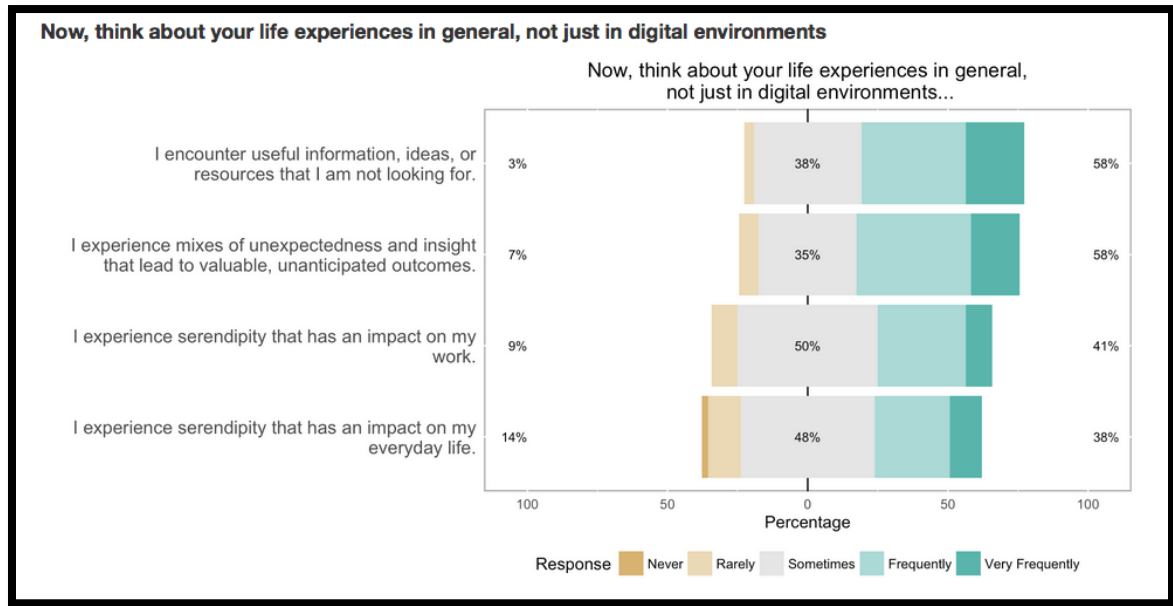
A) Perceptions of serendipity in the digital environments that the historians selected as supporting serendipity
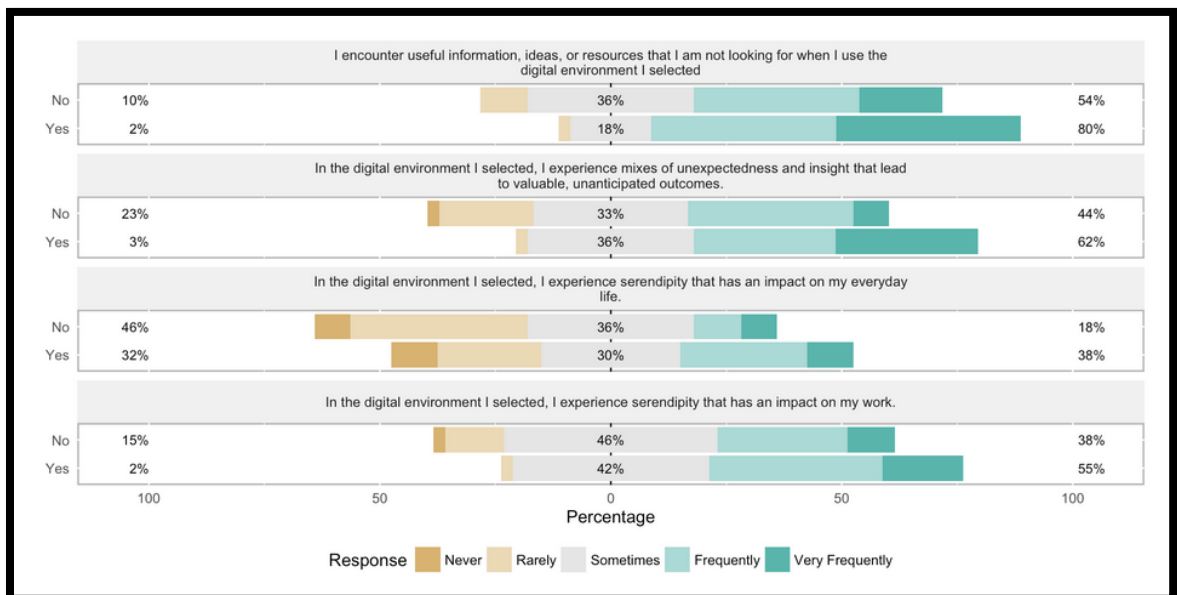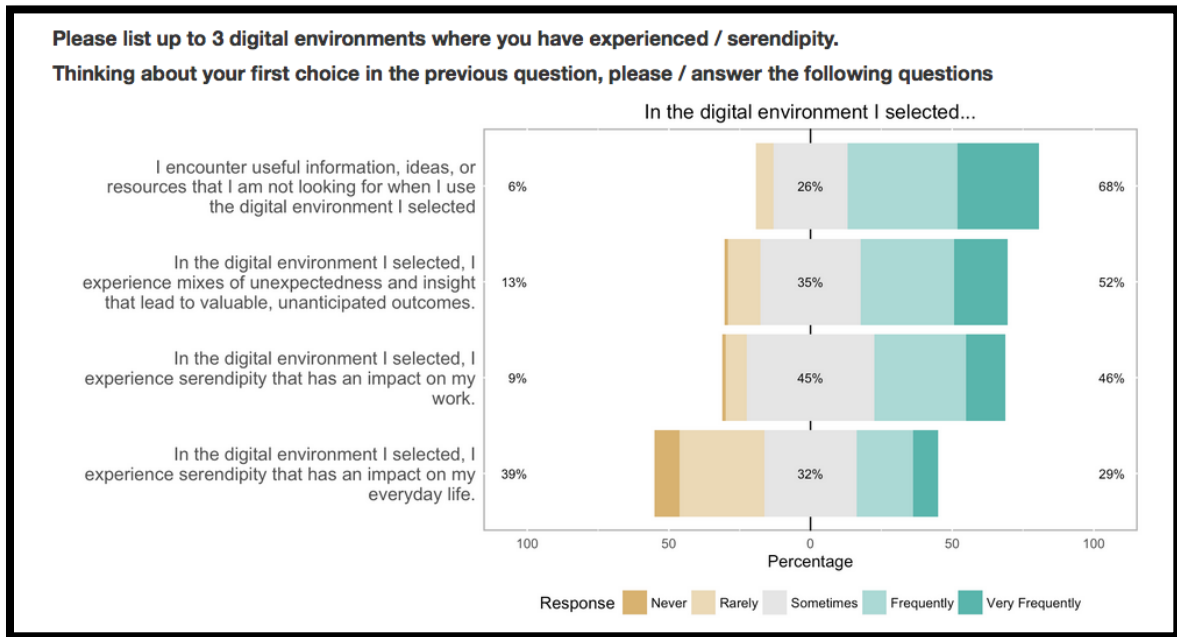
B) Perceptions of serendipity in digital environments in general

C) Perceptions of serendipity in general, not just in digital environments

Curriculum Vitae

Name: Kim Martin

Post-secondary   The University of Western Ontario
Education and   London, Ontario, Canada
Degrees: 2011-2016 Ph.D. L.I.S.

                             The University of Western Ontario
                             London, Ontario, Canada
                             2009-2010 M.L.I.S.

                             University of Guelph
                             Guelph, Ontario, Canada
                             2004-2005 M.A. in History

                             University of Windsor
                             Windsor, Ontario, Canada
                             1999-2003 B.A.

Honours and   Social Science and Humanities Research Council (SSHRC)
Awards: Doctoral Fellowship
                             2013-2015

                             Ontario Graduate Scholarship (OGS)
                             2012-2013

Related Work   Project Manager, Digging Digital Humanities
Experience   The University of Western Ontario
                             2012-2015

                             Instructor, Digital Humanities and Libraries
                             The University of Western Ontario
                             2015

                             Teaching Assistant, Research Methods
                             The University of Western Ontario
                             2014

Publications:

Quan-Haase, A., Martin K, and McCay-Peet, L. (2015) Networks of digital humanities scholars: The informational and social uses and gratifications of Twitter. *Big Data and Society*. Jan-June 2015: 1-12.

Martin, K. and Quan-Haase, A. (2014) "The Impact of Digital Resources on Scholarship in the Digital Humanities" *Encyclopedia of Information Science and Technology*. IGI Global.

Martin, K., & Quan-Haase, A. (2013). Are e-books substituting print books? Tradition, serendipity, and opportunity in the adoption and use of e-books for historical research and teaching. *Journal of the American Society for Information Science, 64*(5), 1016-1028. DOI: 10.1002/asi.22801