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English as a second language user's Information Interaction in an e-Governmental context

D Brazier

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David Brazier

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Abstract

The proliferation of web-based technologies has led most national governments to begin transitioning to a so called "e-service," where provision is made through purely digital means. Despite their obvious benefits for most users, these on-line systems present barriers of access. This research seeks to identify the current information seeking behaviours of English as a second language (ESL) users when performing e-government-related tasks, to ascertain where and why issues arise during this process. Utilising a multi-phase and integrated mixed methods approach, this research investigated how ESL users find information in an e-governmental context, how this differs from native users, and how differences can be supported by the system. The Participatory Design approach identified relevant search task topics, which were utilised during experiments in the second integrated mixed methods phase. Results from the mixed methods phase suggest that success may be less dependent on second language proficiency, but rather the search strategies employed and the fastidiousness of the user in assessing document relevance. There were a number of significant differences identified between ESL and native English participants, but also a number of similarities as both groups were unable to consistently predict when they had not performed particularly well. In light of a solely e-government system, this raises significant concerns about users and the information they rely on to make judgements that can have real world implications. A number of participant recommendations are suggested but one way of mitigating such concerns is to consider the use of system wizards. Performance was high between both groups when this system design was implemented, with positive sentiment (from both groups) towards such a tool as they provide a clear and structured platform to information.

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In dedication to the loving memories of

Frederick Charles Brazier

and

Elizabeth (Betty) Butcher.

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Declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges the opinions, ideas and contributions from the work of others. The ethical clearance and approval needed for this study were obtained and granted by the Engineering and Environments Ethics Committee in March 2016.

I declare that the word count of this Thesis is <ins>40195</ins> words.

Name: David Brazier

Signature:

Date: May 28, 2019

Chapter 1

Introduction

1.1 Study Motivation

With the global-scale proliferation of web-based technologies and the subsequent uptake of electronic services (so called "e-services"), the number of non-English language users on the web is, unsurprisingly, rising also. Recent figures suggest that only slightly over a quarter of all Internet users are English native speakers (Stats 2017). Research has found that, despite the increasing number of users who speak English as a second language (ESL), foreign language (EFL), or do not speak English at all, the extent and quality of content in other languages often does not meet the needs of said users (Berendt & Kralisch 2009). Even when there is enough content available, it has been noted that there are a considerable number of mostly unresolved complexities and issues of monolingual search in non-English languages (Lazarinis et al. 2009, Steichen & Freund 2015). Other than some notable exceptions (Kralisch & Berendt 2004, 2005, Kralisch & Mandl 2006), research into improving the quality of non-English web search was limited (Lazarinis et al. 2009) but has seen a rise in interest over the past ten years, thanks in part to the work of Kralisch and Berendt (2009) and Komlodi and colleagues (Chu et al. 2012, Chu & Komlodi 2017, Komlodi & Caidi 2016, Ondego & Komlodi 2017, Wang et al. 2018). There are also numerous works on Cross Language Information Retrieval (CLIR) (Peters et al. 2012, Vulić & Moens 2015) and translation services for ESL users reading English language content (Chu & Komlodi 2017); however, adoption of these technologies is certainly not universal. As such, many users often still need to seek information by searching in the

English language, regardless of whether it is their native language or not (Aula & Kellar 2009, Rózsa et al. 2015, Wang et al. 2018). This issue is made more serious by the policies of most national governments as they strive to meet the expectant need of users by providing services on a digital platform. This model of electronic (e-) government has been adopted globally with some governments (such as Estonia) leading the way with a fully digital system (Anthes 2015). The United Kingdom (UK) began a 'Digital by Default' initiative, to begin transitioning their services from a "traditional" face-to-face and paper-based paradigm to "e-services", where provision is made through purely digital means (Freeguard et al. 2015) with a total of twenty-five central government services currently provided solely online. This drive for an online system of services has seen increased uptake by local government and subsidiaries such as the NHS, where possible. Unlike central government who have a dedicated team, known as the Government Digital Service (GDS), and a standard template for design (the application programming interface (API) (Service 2018)), both aesthetically and functionally (Service 2012), local government can obtain the API but are left to develop such services independently (De Jong & Lentz 2006). As a result, there are a plethora of local government websites and services, with some (most likely with larger constituents and therefore additional finance) more elaborate than others (De Jong & Lentz 2006, Gray 2014). For those in society who are not adept in the use of such technologies or are not able to readily make sense of the important information delivered through them, this raises concerns around the barriers that may be erected. It also poses the risk of segregating users (Distel & Ogonek 2016), especially those in vulnerable groups (Helbig et al. 2009), such as refugees and migrants (Lloyd et al. 2013). Before any transition to such a self-service, e-government model, all attempts must be made to try and to assist those most at risk of being segregated and to understand any issues they may have in accessing and using these services (Distel & Ogonek 2016). It is with this in mind that this research seeks to identify the current information seeking behaviours of ESL users when performing e-government-related tasks, to ascertain where and why issues arise during this process and how their behaviour differs from those of native English speakers when performing the same tasks under the same conditions.

1.2 Scope

The scope of this research is to identify the information interactions of ESL users when performing e-government related tasks. The definition of ESL in this context is any non-native user of English, and so incorporates both ESL and EFL users. The difference between the two being that ESL users, learn English at school as a lingua franca at a national level, such as in India, whereas EFL, is the learning of English as a taught school subject for educational purposes (Marckwardt 1963, Rosenberg 2007). There is focus on the knowledge and experiences of the target population, ESL users, as such, the research seeks to harness user-centred methods for data collection, towards formulating contextually relevant search tasks. The research specifically focuses on if and how users interact with governmental content and systems in the completion of the search tasks. It does not seek to design and test e-governmental or search systems in experimental settings, but rather to observe the interactions of ESL users in quasi-naturalistic settings, that is live systems, within an experimental environment. The research will also provide a platform for participants to engage in discourse on their experiences and interactions. These perspectives and their interactions will then be employed as recommendations on how e-governmental content and systems could be tailored to improve the interaction experience of those users. There is a plethora of work on why users may or may not utilise a technology, specifically e-government (Bélanger & Carter 2008, Carter & Bélanger 2005, Lin et al. 2011, Wangpipatwong et al. 2008) and on user engagement with a system (Aham-Anyanwu & Li 2017, O'Brien 2011) but these aspects are outside the remit of this research. Firstly, because research on technology acceptance focus on whether they would or do use a technology, in this case e-government, but do not focus on how these technologies are used. It is the 'if 'and 'how 'that is of most interest in this research. User engagement is a double-edged sword, in that, on one hand it is a major contributor to whether a user will interact with a document or system, but studies of user engagement focus on specific numbers of documents or systems. This research has a focus on the interactions of governmental systems; however, participants were not restricted to governmental content only. As such, it is not possible for a comprehensive focus on user engagement of every platform interaction. There is scope for future works on such a

large scale, however, the author would direct the reader to the aforementioned articles for more information on these topics. To help clarify the intent of this research the following section will clearly define the research aim, questions and objectives.

1.3   Research Question, Aims and Objectives

This research aims to identify the current information seeking behaviours of ESL users when performing e-government-related tasks, to ascertain where and why issues arise during this process and how their behaviour differs from those of native English speakers when performing the same tasks under the same conditions. The research questions are:

RQ1 How do English as a second language (ESL) users search for information in an e-governmental context?

The following objectives are set out to answer this question:

RQ1-OBJ1 To evaluate how participants search for and utilise information when tasked with 'simulated work task situations' set in a governmental context.

RQ1-OBJ2 Investigate the role the search task, participant knowledge and experience have on participant performance and behaviours.

RQ1-OBJ3 Explore the extent that participants interact with and utilise the search system, governmental or non-governmental documents and online facilities.

RQ2 To what extent do ESL search behaviours and interactions differ from native English language users?

RQ2-OBJ1 Compare the search behaviours and interactions of ESL and native English participants when tasked with 'simulated work task situations' set in a governmental context.

RQ3 Can potential differences be supported by the search system?

RQ3-OBJ1 Establish the users' perceptions and recommendations for potential changes to government content and system design.

1.4 Output

Several works were published as an outcome of this research and make up the content of this thesis. A comprehensive list of these publications are detailed below, with those making up each chapter noted accordingly throughout.

Doctoral Consortium paper :

Brazier, D., (2017), March. The Long Term Effects of Search Query Examples on the Search Behaviours of Non-native Users of Government E-Services. In Proceedings of the 2017 Conference on Conference Human Information Interaction and Retrieval (pp. 417-419). ACM.

Conference short paper :

Brazier, D. and Harvey, M., (2017), March. Strangers in a strange land: A study of second language speakers searching for e-services. In Proceedings of the 2017 Conference on Conference Human Information Interaction and Retrieval (pp. 281-284). ACM.

Conference full paper:

Brazier, D. and Harvey, M., (2017), April. E-government and the digital divide: a study of English-as-a-second-language users' information behaviour. In European Conference on Information Retrieval (pp. 266-277). Springer, Cham.

Brazier, D. and Harvey, M., (2018), March. A Comparative Study of Native and Non-native Information Seeking Behaviours. In European Conference on Information Retrieval (pp. 237-248). Springer, Cham.

1.5 Impact

This thesis' contribution to knowledge includes:

- The use of Participatory Design as a viable approach to construct contextually relevant search topics.

- Utilising participatory design and experiments in the exploration of e-governmental system usage.

- Demonstrates search behaviours of ESL users in comparison to extant research, which can be useful in the development of e-governmental systems.

- Offering recommendations for the improvement of e-governmental content and system design.

1.6 Thesis Structure

Introduction

This is the current chapter, which presents an overview of the research and the thesis. Sections within this chapter make up the motivation for the study; scope of the research; the research question, aims and objectives; published output; research impact and thesis structure.

Literature Review

This chapter presents extant research and the current state of knowledge in the fields of Information Interaction, English as a second language user studies and e-Government use. It explores and identifies the gaps in knowledge that this research aims to fill.

Methodology

This chapter presents the philosophical, ontological and methodological decisions that underpin the research design, giving justifications both from extant research and, most importantly, in line with the research aim, questions and objectives. The research strategy, as detailed in Figure 1.1, is discussed, with justifications provided for the data collection methods used, study population sampling, recruitment methods and ethical considerations.
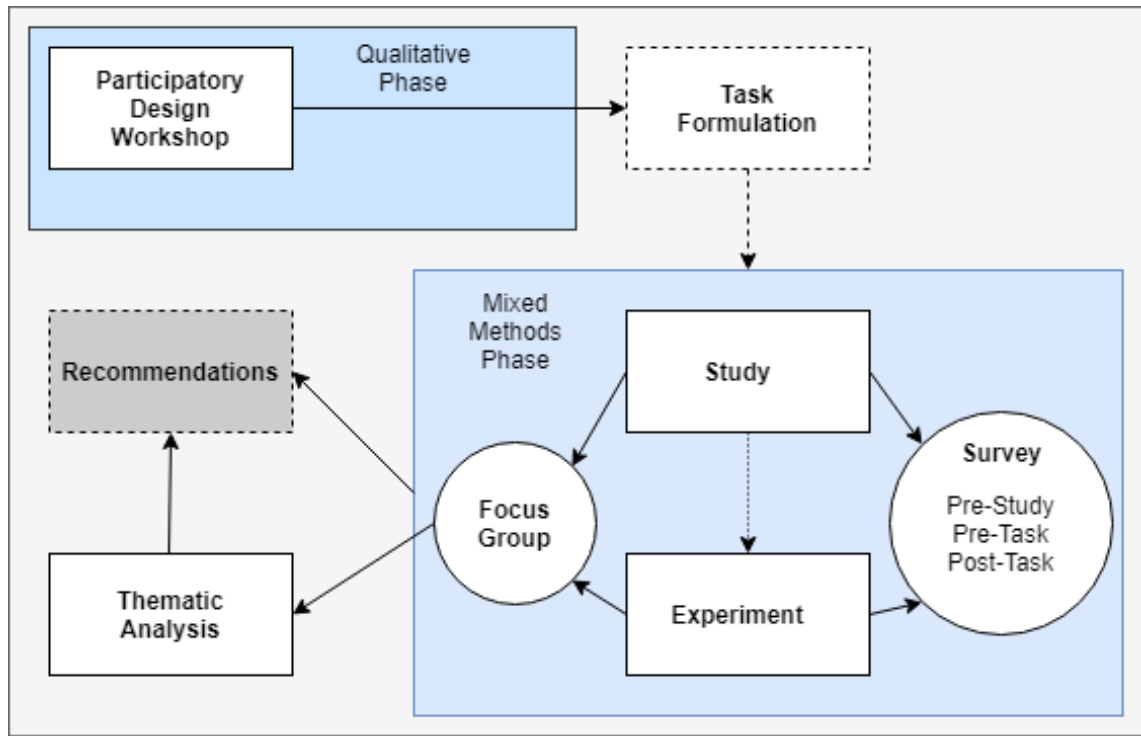
Figure 1.1: Research Design Model

Findings: Participatory Design Workshop

This chapter presents the analysis and findings from the first phase study. Sections in this chapter include detailing the participants knowledge of types of e-governmental services. Building on this identification the participants analysed problems surrounding such services, factors that cause the need for the service and the effects of the service. Following this, participants identified the information needs of visa service users, potential information sources and the necessary skills required to resolve these information needs. Findings from this study provide contextually relevant topics to inform the formulation of search task scenarios for use in subsequent experimental studies in the research.

Findings: Study

This chapter presents the analysis and findings from the study as part of the mixed methods phase, and the development of the search tasks, which are to provide context for the research. It examines the ways in which ESL users approach a number of important search tasks and the problems they face in doing so.

Findings: Experiments

This chapter presents the analysis and findings from the experiment as part of the mixed methods phase. Detailing the comparison of ESL and native English language users information interactions when conducting search tasks.

Post Study Focus Groups and Themes

This chapter presents the analysis and findings of the post discussion focus groups with five themes and fifteen subthemes along with a number of recommendations identified.

Discussion

This chapter discusses the implications of the findings of chapters four, five, six and seven in relation to the key aspects of information interaction, namely, the user, content and the system.

Conclusion

This chapter will conclude the thesis, demonstrating the results in relation to the research aims and objectives, the research's original contribution to knowledge, the research' limitations and opportunities for future works.

1.7 Summary

This chapter presented the motivation for the research, explicitly outlining its scope. This was proceeded by the research questions, aims and objectives; the scholarly output as result of the research; the contribution to knowledge before summarising the thesis structure. The following chapter presents a comprehensive literature review and the current state of knowledge in the fields pertinent to addressing the research aims and objectives.

Chapter 2

Literature Review

2.1 Introduction

This chapter contains details of a comprehensive literature review of extant research in areas that have direct bearing on the research problem. The aim of this is to set out definitions of terminology that will guide the research, highlight the works which have influenced, contributed to and established the research areas this project aligns itself to. As well as highlight the gaps in knowledge that this research aims to fill. It begins by detailing information interaction and the facets of this disciplines that make up this field of study focusing on information searching, relevance judgements and feedback and search tasks. These areas give an introduction to terms and concepts which have a direct baring on the three research questions from a information search perspective. This will be followed by the review of literature on English as a second language and its mediating effects, before specifically focusing on studies of English as a second language users information searching. The chapter will conclude with the review of governmental information systems and content, giving an overview of the e-governmental context which this research resides within, before finally summarising the chapter.

2.2 What is Information Interaction?

2.2.1 Information

Information has been conceptualised numerous times over the past 60 years (Capurro & Hjørland 2003) as theories and models have developed, and as technological advances have broadened the scope of what constitutes information (Fidel 2012). It is widely considered that no one definition can be agreed upon (Capurro & Hjørland 2003, Case 2012) and by no means does the author attempt to provide a comprehensive overview of the defining of information, however, the following examples give but an insight to the vast literature on the topic. Bateson identifies a unit of information as "*a difference that makes a difference*" (2000, pp.459). It has also been discussed in the form of patterns such as any aspect you notice in the pattern of reality (Case 2012), as recognition of patterns in the world around us (Dervin 1976, cited in Case 2012) and a pattern of recognisable meaning that may reduce the level of uncertainty in the decision maker (Higgins 1999). Buckland (1991) defined information as a multifaceted concept, which could be categorised as knowledge (belief), as process (a change in knowledge or becoming informed (Byström & Järvelin 1995)) or as thing (knowledge). This is further applied in the context of task and information needs as information is categorised into domain (known facts), problem (problem characteristics) and problem solving (expertise) information. Byström & Järvelin (1995) adopted the definition due to its application to Buckland (1991)'s own. This research accepts that something can be categorised as information based on the situation and context in which it finds itself, and is made up of known facts, problem characteristics and expertise.

2.2.2 Information Interaction

If we wish to understand how people interact with information systems with a view to improving such systems and those interactions then it is necessary to identify the purpose for those interactions, the experiences and emotions expressed during the process, the effects of system features and performance and the overall impact these aspects have on repeat use. The following section will detail the works which set out to explore such questions

by defining the phenomena they were observing. Information interaction, also referred to as human-information interaction (Marchionini 2008, Fidel 2012), is a complex integrated process (Toms 2002), combining the content (information), the user and the system (see Figure 2.1). The dynamic nature of the relationships between these components are
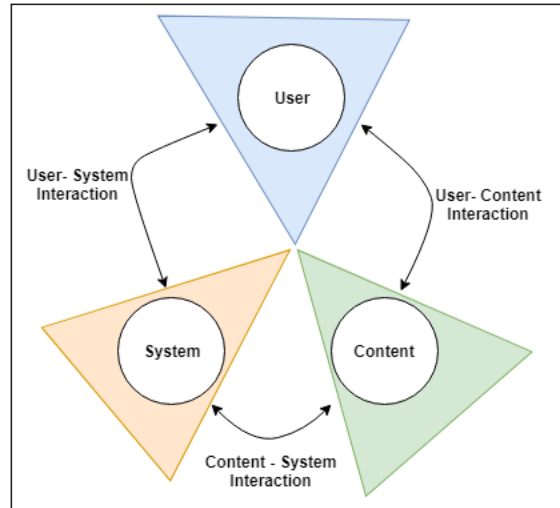
Figure 2.1: Model of Information Interaction, adapted from (Toms 2002, pp.859)

exhibited in the interactions (Fidel 2012) and imply the involvement of human users (Borlund 2013), and their reflected experiences and actions (Toms 2002). Gershon (1995, as cited by O'Brien 2011) defines it as how humans interact, relate and process information regardless of the medium used as a conduit. Information Interaction is multidisciplinary and builds on the research of those who have attempted to understand and model Information Behaviour, such as Belkin's Anomalous States of Knowledge (1980), Kuhlthaus' Information Search Process model (1991), and Marchionini's Information Seeking Process (1997). It also incorporates aspects of Information Behaviour, Information Seeking, Human Computer Interaction, Social Informatics, Management, and Library and Information Sciences (Fidel 2012). The remainder of this section will focus on the area of Information Searching which is best aligned with this research project.

2.3 Information Searching

Information searching concerns the behaviours of users interacting with systems of all types, whether at the level of interacting with a computer interface or at the intellectual level (Wilson 2000). There are a wide variety of information objects (providers and

sources) (Robson & Robinson 2013) from which users can attempt to resolve an information need. However, when faced with an information need associated with governmental services, there are certain information sources which are best suited or preferred in resolving this information need, with selection of the source or system dictated by the task at hand, expertise or ease of access (Byström & Järvelin 1995, Savolainen 1995, Lloyd et al. 2013). Social ties may be seen as readily accessible information sources (McKenzie 2003), such as interactions with social groups, family or experts in traditional governmental services, that is via face to face or telephonic facilities (Reddick & Turner 2012, Lloyd et al. 2013). In certain situations, however, these options are unavailable if services are being digitised (Freeguard et al. 2015), alternatives are preferred (Reddick & Turner 2012), the user is not aware of their availability, does not have access or they do not meet the user's requirements (Helbig et al. 2009, Vinson 2009, Lloyd et al. 2013). One of the most common situations in which people seek information in the modern world is when searching the web, due to the ubiquity of web technologies and the access to information that online search engines afford (Spink et al. 2001). There are several strategies devised to enable success using web search (Ford 2015) including active searching (Bates 2002), browsing (Case & Given 2016) and serendipitous encounters (Foster & Ford 2003).

2.3.1 Active Search

Active searching involves a direct goal oriented approach by a searcher, with the aim of a specific question they are seeking to obtain sources for (White 2016). Submission of search queries, keyword or short statement entries in the search system, are an example of direct behaviour (White 2016) and have been investigated rigorously in information studies (Jansen et al. 2000, Belkin et al. 2003) and is a staple addition in the study of ESL information behaviours (Kralisch & Mandl 2006, Chu et al. 2012). A search query or term is a string of word(s) typed into a search box by the user (typically) and submitted to a search engine, whereby documents containing those terms are retrieved and displayed for evaluation in a Search Engine Results Page (SERP) (Marchionini 1997). For those who may lack the vocabulary, expertise with the search system or domain knowledge this can be problematic (White 2011). In response to these problems, search systems have several

assistive functionalities (Wilson 2011) in which to aid the user in their search for information. Such facilities include (but are not limited to) query auto-complete, whereby the search system provides recommended query terms while typing, in a bid to pre-empt your search and offer suggestions, and query by example, which offer terms on the search results page which are "more like this" (Wilson 2011, pp.149). Despite its advent, Nielsen (2011) found a distinct lack of advanced search use, and in cases where advanced features were utilised they were implemented incorrectly. He surmises that (web) search is too good and is causing users to never develop effective research skills or even to consider alternative approaches. Web search plays an integral but dangerous role in people's lives. As users and search become ever more symbiotic, search continues to undermine problem solving skills, as assumptions are made that the search engine results provided must be correct (Pan et al. 2007, Nielsen 2011). This assumption leads to the notion of a document's relevance towards the task at hand or the need for which it is being sought.

2.3.2 Browsing

Browsing, in comparison, is an active but indirect exploration of documents and sources with no clear goal (Case & Given 2016, White 2016) other than to resolve curiosity (Toms 1999). It is based on recognition orientation and closely linked to that of following an information scent (White 2016) as detailed in Information Foraging theory (Pirolli 2007), which is discussed in more detail in section 2.4. Marchionini (1997) identified three types of browsing: *directed browsing*, which involves focused browsing of documents for a fixed goal; *semi-directed browsing*, where the target is more vague and systematic strategy employed; and *undirected browsing* where there is no purpose or direct focus. (Bates 1990) explains that research strategies are typically fluid as activities change as the user interacts with information (Jiang, He, Kelly & Allan 2017), making it difficult to pre-determine the exact number of search activities any given task will require. Observations by Nielsen (2011) show that in only 1% of cases did users change search strategies. Preferring instead to 'plod along' with the selected strategy regardless of results, highlighting the lack of awareness, and application, of effective research skills.

2.3.3 Relevance Judgement

Relevance is a complex and multidimensional concept dependant on a user's perception of their needs and information (Borlund 2003*a*). Extant research has focused on this non-binary perspective with studies attempting to complement relevance judgements with understandability (Palotti et al. 2016), effort (Jiang & Allan 2016), readability (van Doorn et al. 2016), usefulness (Mao et al. 2016), content/topic (Tombros et al. 2005, Ondego & Komlodi 2017), trust and reputation (Pan et al. 2007, Ondego & Komlodi 2017) and source and authority (Tombros et al. 2005, Crystal & Greenberg 2006, Ondego & Komlodi 2017) amongst others. In the evaluation of test collection-based information retrieval systems, human assessment of relevance are utilised, as seen in the Cranfield experiment model, whereby assessors judge documents by the criteria of topical relevance (Jiang, He & Allan 2017). In these cases, documents are judged by rating a document relevant, partially relevant or not relevant (Verma et al. 2016) or judged relevant or not (White 2016). Consideration of the user and their own explicit perceptions of relevance of a document can be considered (Borlund 2003*a*, Saracevic 2007), especially as relevance is fluid based on the stage of the task upon which it is being judged (Jiang, He, Kelly & Allan 2017). In this situation, users explicitly assess and give feedback on their interactions or document selection (Tombros et al. 2005). Implicit relevance feedback, as an alternative, has been investigated based on user dwell time on documents, document scrolling, hyperlink clicking, bookmarking of documents or printing and eye gaze tracking as means to infer interest (Saracevic 2007, Kelly et al. 2009, White 2016).

The time spent dwelling on a document is an implicit determination of the time spent reading and significant indicator for user interest and document relevance (Liu, White & Dumais 2010, Borlund et al. 2012, White 2016). Although it is a common measure within information studies, other factors come into play which may not be a true indication of its interest or relevance to the task. These factors include the fact that dwell time does not account for prior knowledge and external requirements (Borlund et al. 2012), task type (Kelly & Belkin 2004) or what users are doing outside of the browser(if not being directly observed) (Kim et al. 2014). Although deemed more inaccurate than that of explicit relevance feedback it is a viable and effective substitute (White et al. 2009).

There are cognitive fatigue concerns in relying on user's self-judgement as an extra stage in the task process (White 2011), therefore for the purposes of this study, implicit relevance to topic has been considered with users not asked to self-assess. This has been far from a comprehensive review of the literature, in part due to space and that it is not the sole focus of this thesis. The researcher refers the reader to the works of Mizzaro (1997) and Saracevic (2007) for a holistic and detailed perspective on the topic.

2.3.4 Tasks

The tasks which bring a user to begin to search for information (whether online or otherwise) have defined goals with intentional and possible unknown outcomes (Toms 2011). These tasks provide insight into why people search for information, how they search, the sources they utilise and the information's utility (Byström & Hansen 2005). In complex and real-world situations the activities required to complete a task, and the length of time taken can span predefined processes and timescales (Byström & Hansen 2005) or be complete in different but acceptable ways (Toms 2011). The development of tasks were born out of a need for 'realism and control'as such simulated work task situations were developed (Borlund 2003*b*). These provide short but descriptive stories that provide context and deeper explanation as to how the information need arose rather than a topic based description (Kelly et al. 2009). It would seem that allowing users the opportunity to conduct their own search tasks would resolve this issue of realism and is advocated as a means to introduce participants to the experimental nature of the research being conducted and provide a baseline against the simulated information needs (Borlund 2003*b*). However, there is a need for simulated work tasks, otherwise issues arise over the generalisable nature of the tasks being conducted (Kelly et al. 2009). In her meta-review of the simulated work task literature, Borlund (2016) discusses a number of issues arising from the lack of user participation and the use of these baselines in the research which cited here 2003 article. It was this concept of user participation which led the researcher to consider a participatory approach to the development of such work tasks. Although (Wildemuth 2002) discusses the use of real world scenarios through the use of Participatory Action Research in an Information Science context, there was little to no evidence of the use of a participatory

approach in the development of search tasks in the literature, as such this was considered a worthwhile area to explore in this research. For an in depth analysis of the development and evaluation of the simulated work task the researcher refers the reader to the works of Borlund (2003*b*, 2016).

2.3.5   Domain Knowledge

Although not an interaction, domain or topic knowledge has been shown to effect search behaviours (Savolainen & Kari 2006) as such is deemed pertinent to this research. That is, domain expertise accounted for differences in the sites that were visited, the vocabulary used for querying, search behaviour patterns and the overall success of the search (White et al. 2009, Arguello et al. 2018). It has also been found to affect the adoption of Search Engines amongst users of a second language, especially by experts (Kralisch & Berendt 2005).

2.4   English as a second language information searching

This section will review the literature on English as a second language, looking into the search behaviours of users, the role of relevance judgements and implicit feedback identifying pertinent user studies before discussing the role of language and the content of web documents. The section will end with information access.

2.4.1   Information Searching Behaviours

The Theory of Information Foraging (Pirolli 2007) dictates that users will forage from one source, or in total, for as long as the costs of foraging, in terms of time and energy spent, do not exceed the rewards. Kralisch & Berendt (2005) identified that these cost benefit trade-offs explain the differences between native and non-native speakers accessing of websites, but not the differences in navigation patterns among those that access. That is – language proficiency is moot as people determine the language requirements for accessing a website prior to access, and the costs of searching for information on the website (in their case) would exceed the possible benefits. They also identified that when both a user's

linguistic skills and domain knowledge were low, use, in this case of the medical website, may become too demanding, as identified by the low number of non-native speaking patients (Kralisch & Berendt 2004). It must be noted, that when self-assessing second language proficiency, users have been found to under-estimate their own abilities (Marlow et al. 2008). Józsa et al. (2012) considered the differences between native language and foreign language information seeking tasks. From the study they identified two different search strategies: superficial or cursory and in-depth, with little differences between performance when applying an in-depth strategy in both languages. Alternatively, it was found the superficial strategy in a foreign language performed much worse than in the native language. One explanation being that foreign language users, who may not be as familiar with nuances in the language, may miss signs of such subtle markers when not thoroughly analysing a document and thus may gather a lower quality result set. These missed signs can be linked to information scent, as detailed in the Information Foraging Theory (Pirolli 2007), which is the perception of the value and cost of following a trail of information, based on its adjacent cues, such as hyper-links within a web document. If these cues are missed or misinterpreted it stands to reason that users may judge the time and effort of continuing to exceed the benefits of proceeding further (Kralisch & Berendt 2005).

Chu et al. (2012) found that the IT literacy and abilities of the user are important factors when it comes to searching in a foreign language. When compared to searching in their native tongue, users required significantly more time, submitted more query reformulations and viewed/assessed a greater number of websites. Those with only an intermediate grasp of the foreign language struggled with query reformulation, also identified by Aula & Kellar (2009), although they did not find identification of relevant results quite so difficult. In contrast to this, Bogers et al. (2016) focused on the differences in behaviour between native and non-native English speakers when searching for books. Although the study found non-natives spent more time on task than native speakers, it revealed very little difference between the two groups in relation to the number of queries, query length, depth of results inspection or books added to the book bag. They surmised this could be as a result of their users' experience in searching for books in English and

having acceptable foreign language skills. In their study of multilingual users, Rózsa et al. (2015) identified a propensity for short specific, often one-word queries submitted, which led to a large proportion of vague results and overwhelmed users. This in turn led to users spending more time reading documents or limiting their selection to one specific document and exhausting the content there, rather than scan the full results list. Their study also revealed a user reliance on assistive functionality, such as autofill or recommended links, to compensate for a lack of confidence in users' query formulation ability.

Chu et al. (2012) identified that foreign language users found judging document quality more difficult and made a conscious effort to seek less verbose content, preferring more visual alternatives such as images, also identified by Rózsa et al. (2015), and were prone to seek multiple sources of content to form a rounded view of a topic - if confidence in the language of the content was lacking. Users' levels of prior knowledge are important when using the Internet as a source of information which could potentially be a result of their educational levels, especially in a minority language situation (Kralisch & Berendt 2005, pp.242). Their previous experiences, domain (topic) knowledge and the credence placed on the author and source which develop and form preconceived notion and set expectations of how a service or online system will meet their needs (Ondego & Komlodi 2017, Martzoukou & Burnett 2018). It is these notions and expectations, and the extent to which they have been met, which then dictate the likelihood of user's reuse of the service or system (Nielsen 2011). In light of the research objective **[RQ1-OBJ3]** it remains to be seen whether users domain knowledge and pre-conceived notions will dictate the use or non-use of governmental content in this research.

Existing literature on the study of ESL and native language users search behaviours has showed a number of differences, but just as equally similarities, as detailed through the analysis of their implicit and explicit feedback. It is this lack of consensus, and authors (in the case of Rózsa et al. (2015)) admittance of a gap in the literature investigating how these users search for information, which drives this research.

2.4.2 Linguistic Determinants: English as a Second or Foreign Language

Typically, lower levels of proficiency result in non-native speakers having less developed terminological knowledge than that of native speakers (Kralisch & Berendt 2005). Even in the event of attaining fluency in both a native and secondary language, the higher cognitive costs remain (Grabe 2009). From a web search perspective language proficiency has a significant impact on the search experience and outcomes (Chu et al. 2012, Józsa et al. 2012). Accessibility to, and the extent of, online text enforces the need for effective reading skills and information seeking strategies. A lack thereof, makes success in modern society (in any capacity) much harder to come by (Marchionini 1997). Grabe identifies that electronic communication methods amplify the requirement for skilled reading rather than compensating for weak literacy skills (2009). Despite the advent of assistive functionality (Clough & Eleta 2010) (which are utilised by a large proportion of online search engines and websites), providing the necessary skills to identify, interpret and evaluate information pertinent to the task or goal is fundamental to a user' full inclusion into both digital and non-digital communities (Józsa et al. 2012). Future opportunities for success and development are interwoven with skilled reading ability as user' second language reading skills dictate their futures as they establish and develop a career and integrate and advance their socio-cultural position (Grabe 2009). Language differences do not always equate to a digital divide (Kralisch & Berendt 2005). However, education level and domain knowledge have been found to contribute (Weber et al. 2018), with Kralisch and Berendt (2005) identifying a segregation between second language users with high and low educational levels. This could be found to compound the information poverty of such groups, and as such more emphasis is placed on the design of websites, their features and content (Kralisch & Berendt 2005) to ensure accessibility and suitability for all users (Lloyd et al. 2013).

2.4.3 Web content use

As of June 2017, English language content made up 51.5% down from 57.6% in 2011 (W3Techs 2017). The questions of native versus non-native web content use suggest

that there is a considerably higher ratio of native language users accessing medical web content than non-native users (Berendt & Kralisch 2009) as found in the log-file study of a large and frequently visited medical website that provided (at the time) content in English, Spanish, German, French and Portuguese (Kralisch & Berendt 2004, 2005). Kralisch and colleagues (Kralisch & Berendt 2004, Berendt & Kralisch 2009) identified that content users and providers have a propensity to under-represent non-English language content. As there is less content in these languages, there are less links set to this content, resulting in less link following. This was found to have significant impact on user satisfaction due to the increased cognitive load from information seeking (Berendt & Kralisch 2009). Although discussing in the context of digital libraries, (Clough & Eleta 2010) identify that digital facilities remove physical and spatial barriers in information access, however, due to the multilingualism of content and the users, language barriers remain.

2.4.4 Content and the Role of Language

Language of content is especially important when users are trying to find information. Whether the language is intended towards the public or a specific target audience dictates the ease with which it can be read, interpreted, processed and used. These four aspects make up the building blocks to literacy and will be considered in this section.

Reading

The user's ability to read the content is paramount to the information addressing a particular need, or in relaying often vital details about a topic, which the author believes to be of importance (Coiro 2011). How this is achieved is due to the medium with which the content is delivered, the language used, and the formatting. The medium dictates how readily available the content is, in that if it is within a physical document, users must have access to the document either in a library or some other facility (Robson & Robinson 2013). If the document is in a digital format then the opportunities for dissemination are increased with the advent of Internet technologies (Coiro 2011). The ability to critically evaluate information ensures a user can determine that information, and its source, is both reliable and accurate, and to recognise bias (Leu et al. 2011). This is an important as-

pect of online reading and places a greater need on being able to cross-examine content across multiple sources to ensure both the content and the source retain their validity (Park et al. 2014). Tillman (2002, cited in (Leu et al. 2017)) predicted the difficulties in differentiating promotional and advertising efforts on the Internet. Forward eleven years and Leu et al.(2017) compound this prediction by highlighting the increased challenges that unedited information and the merge of advertising and educational content have caused. Skimming and scanning online documents as a search strategy have been identified as being essential for Park et al. (2014), with the participants in their study highlighting their 'computer search skills 'by utilising the ctrl+F shortcut to quickly locate and zone in on keywords. A sentiment echoed in the study by Rózsa et al. (2015).

Processing

The cognitive costs of information processing in a second language exceed those of processing a native (primary) language, so it is unsurprising that processing a second language at a lower proficiency level significantly increases cognitive effort compared to the processing of a second language with high proficiency (Berendt & Kralisch 2009). The dense and complex semantic network a person acquires accounts for the differences native and non-native speakers have in processing information. A semantic network's structure thus reflects a language's organised meaning (Kralisch & Berendt 2005). The relationship between language and cognitive effort have a profound impact on the perception of ease of use (Berendt & Kralisch 2009), as such users show preference towards information seeking in a native language when offered the opportunity, but will navigate in an alternative language, in this case English, when native language content is scarce (Kralisch & Berendt 2004, Berendt & Kralisch 2009). Several cognitive processes are required to utilise an information system, including but are not limited to: information seeking, knowledge acquisition and problem solving. These processes are influenced by subtle differences in cognition such as cognitive ability, cognitive style and problem-solving ability (Kim & Allen 2002). In their study of cognitive and task influences on web searching, Kim & Allen (2002) found links between cognitive ability and task that influenced how many searches were complete, the number of keyword searches complete and

documents viewed and bookmarked. Also noting that web search features can facilitate differences in cognitive ability when users are completing certain tasks. It was found that those with lower cognitive ability (problem solving skills) completing ill-structured tasks (vaguer and more general) suffered from information overload and higher workloads (Kim & Allen 2002, Brennan et al. 2014). These users can be supported if search options are restricted to those appropriate to the task. In this case, promoting keyword search and reducing the need for features that support browsing, and therefore information overload and higher (time) costs. They conclude that there are many cognitive variables and an indefinite number of tasks, making it increasingly difficult to provide recommendations for website and system design that account for all variations between users and tasks characteristics (Kim & Allen 2002).

Interpreting

Listening and reading make up the receptive or passive language skills (Kralisch & Berendt 2005, Clough & Eleta 2010), which are developed at an early stage in second language vocabulary development. These are often to a higher level than the productive (active) language skills, speaking and writing, which are more complex and require more cognitive effort (Kralisch & Berendt 2005). A user may also be able to understand documents in a foreign language but unable to write the query in the relevant language to find it (Clough & Eleta 2010, pp.87). Marlow et al. (2008) explored the use of assistive facilities when conducting information retrieval tasks such as Google Translate, and how various functionality assists users when searching in their native language, a passive language and an unknown language. For users with lower English proficiency, translational and language tools are important and helpful for performance and user approval (of the websites in question) but should not come at the expense of web content. However, they go on to advise that language tools are more useful as features for generic web search engines (Allan et al. 2003), with individual providers recommended to provide facilities based on domain, user groups and competing information (Berendt & Kralisch 2009). In the study of the effects of language skill and study field on language preference when searching online and within a university setting, Clough & Eleta (2010) found that there was a significant

correlation between the proficiency in a foreign language and the frequency in searching in a foreign language, especially for social sciences, the arts and humanities, compared to engineering or the sciences (physics, Geology or computer sciences). Berendt & Kralisch (2009) concurs having identified a "linguistic upper class" of people who are proficient in English, who often prefer to navigate in English (even if offered content in their own language) and are more scrutinising of the quality of Web content. This scrutinisation, is the depth to which the source of the content is judged for reliability and validity, and the content itself judged for relevance and usefulness to the information need as discussed in subsection 2.3.3.

Byström & Järvelin (1995) conducted a qualitative study on the effects of task complexity on information seeking, in terms of the information types and the sources and channels by which this information is sought. They concluded that there are distinct contrasts between simple and complex tasks. Identifying that understanding, sense-making and problem formulation are essential as task complexity increase with more diverse channels, sources and different types of information required. Marlow et al. (2008) identified that the perception and actual difficulty of tasks were found to increase as familiarity with the second language decreased.

Utilising

Familiarity with the web affords users the opportunity to demonstrate higher levels of knowledge and skill in the retrieval of specific pertinent information (Bilal 2004, Leu et al. 2005). Whereas, those more inexperienced in reading online information lack familiarity with online conventions and the available features that may assist them (Eagleton & Guinee 2002). It has also been noted that those same inexperienced users are prone to make hasty and ill-judged decisions due to bypassing useful and relevant information when searching for information (Coiro 2011, Józsa et al. 2012).

2.4.5 Information Access

Ensuring that online information can be accessed across languages can follow two approaches. It can concentrate on enhancing tools for translation and multi-language re-

trieval. Alternatively, it can focus on user behaviours and attitudes, and investigate languages impact on web search, with the intention of informing web standards and best practice (Berendt & Kralisch 2009). Social exclusion builds out of a lack of information, as it "creates conditions and barriers that prohibit full participation in education, work, and every-day life" (Lloyd et al. 2013, pp.123). Information access is also a fundamental requirement for social inclusion (Lloyd et al. 2013). Communities that employ online and digital means of information dissemination (Freeguard et al. 2015) are creating barriers especially for those in society, who are not adept in the use of online and digital technologies or are not able to readily make sense of the important information delivered through them. Concerns are raised due to the barriers that may be erected and the risk this poses of segregating users, especially those in vulnerable groups (Helbig et al. 2009, Yu 2010), such as refugees and migrants (Lloyd et al. 2013) as a result of "limited support networks, [an] inability to access the labour market, alienation from society and poorer educational outcomes" (Vinson 2009, pp.7).

2.5 Government Services

This section will review the literature on governmental services, starting with what is meant by e-government in this research context. It will go on to describe inclusivity and digital citizenship. Next, it shall discuss the extant research on e-government user studies before discussing location as a context for these studies.

2.5.1 Government services defined

Electronic (e-) government has been largely defined as "government's use of information and communication technologies (ICTs) for purposes of governance" (Roman & Miller 2013, pp.66) or the use of information technology to enable and improve the efficiency with which government services are provided to stakeholders (Carter & Bélanger 2005). The provision of government information and services include providing an online presence for government, cataloguing and presenting governmental information, transactional services and forms (Layne & Lee 2001, Lee-Geiller & Lee 2019) and providing a platform

for civic engagement (Kolsaker & Lee-Kelley 2008, David 2018).

Implementation of an e-government system must consider several stakeholders, of which Wirtz (Wirtz, 2010 as cited in (Wirtz & Daiser 2015) identified four. Government to Government (G2G), which consider government and public sector bodies to collaborate and co-operate. Government to Business (G2B) which provides information and services as well as interactions between the government and for profit non-governmental organisations. Government to NPO which is the interactions between government and non-profit non-governmental organisations. Finally, Government to Citizen (G2C) which considers government, citizens and the provision of public services and e-democracy. For the purposes of this project, only G2C has been considered.

2.5.2 Inclusivity

Due to the proliferation of web technologies and increased accessibility of information governments are competing with a vast number of relevant information providers (Wirtz & Daiser 2015). However, due to the rising prominence of disinformation ('fake news') (Karlova & Fisher 2013), the public's changing behaviours and increased desire for information, it is with ever increasing importance that governments ensure they effectively adapt and revise their role and delivery model within this digital world (Milakovich 2012). Mossberger et al. (2008) considers digital citizenship, and the ability of the individual to regularly and effectively participate in society online. The socio-cultural barriers of information seeking, of which institutional and user language barriers are just some, is raised by Savolainen (2016). He posits that these aspects have been considered in several contexts, by several researchers, but there remains work to be done on the extent to which these barriers are hindering, delaying or preventing information access, as well as the possibilities of offering alternative routes to information. This raises questions about users whose native language is not English, and the barriers they face if governmental services are solely accessible online (Helbig et al. 2009, Lloyd et al. 2013). The extent to which users can determine the trust and transparency of e-government, is also important as they have been identified as mediators and moderators of a users intentions to use and be satisfied with e-governmental service use (Horsburgh et al. 2011, Venkatesh et al. 2016).

2.5.3 e-Government Technology Acceptance Studies

A significant proportion of the extant research on e-Government interaction typically takes the approach of user' technology acceptance or usage (whether it is used or not used) rather than how it is actually used (Kumar et al. 2017, Wirtz & Daiser 2018). The Technology Acceptance Model (TAM) (Davis 1989) proposes that a user' behavioural intention best predicts actual use of a system. Where behavioural intent is comprised of the belief of perceived usefulness and ease of use. That is, the degree to which a user believes a system can improve performance with the least amount of effort (Davis 1989). TAM is a popular model for explaining acceptance of information systems, as highlighted by the high number of citations, approximately 40000 at the time of writing. In an e-governmental context this model has been utilised, but once again only in identifying whether it is used, rather than how or why (Carter & Bélanger 2005, Lin et al. 2011, Wangpipatwong et al. 2008). In their literature review of studies into technology adoption and diffusion Williams et al. (2009) identified several methodological trends, with most studies employing surveys, case studies and literature, conceptual or meta-analysis. It is interesting to note that some methods and approaches utilised such as action research or lab experiments only accounted for 0.3% and 1% respectively. Wirtz & Daiser (2018) conducted a meta-analysis of 129 studies of e-government, identifying that the use of questionnaires for quantitative data collection were prolific, at 64%, followed by secondary data. Use of experiments is not discussed however, field studies (7%) and interviews (3%) were least used. Wirtz & Daiser (2018) goes on to identify that there is no trend or focus on the improvement of e-government within these studies. Not utilising TAM, De Jong & Lentz (2006) consider using non-native English speakers' user profiles as a means of creating a scenario evaluation method for expert evaluation of municipal (local) government web sites. However, due to the vast array of potential users, focusing on specific demographics such as non-native speaking, visual impairment or low education levels is identified as being less effective than focusing on information skills, attitudes and experience of using the Internet. Despite providing positive results by detecting large numbers of user problems, they conclude that user friendly internet communication is a long way off for municipalities. This perspective was continued with local

governments slow to progress citizen engagement and show little effort to increase inter-
actions (Sandoval-Almazan & Gil-Garcia 2012). Wirtz & Kurtz (2017) identified several
user-centred factors local e-government practitioners should consider for the successful
adoption of such services. These include, but are not limited to, mobile accessibility
(due to the rise in ubiquitous mobile technologies), addressing the 'currentness' of the
information provided and a focus on user-oriented services. In a bid to promote user-
orientated services, and to provide guidance and transparency to development of services,
the Government Digital Service, whom are responsible for the design and development of
GOV.UK, published (and maintain) general design principles which act as guidelines and
best practice (Service 2012) as well as standard templates (Service 2018). Lee-Geiller &
Lee (2019) found there was still a focus on a provider perspective despite governments'
drive for digital citizenship and governance through shared learning (between users and
government), democratic process and coproduction (Layne & Lee 2001, Lee-Geiller &
Lee 2019).

2.5.4 Location as context

A large proportion of the extant research is in a governmental context outside of the
United Kingdom. In a study of refugees trying to access e-Government services in Aus-
tralia, Lloyd et al. (2013) found that the information poverty they experience was a prod-
uct of the social exclusion of the participants because of barriers e-services can erect.
The study suggested that many issues stem from the fact that the community receiving
the refugees has developed assumptions about how information is best disseminated, as-
sumptions which may not hold true for the refugees themselves. Due to the very nature
of governmental content, the delivery of the information is designed and written in such a
way to make it accessible to a wide array of users, representative of the populace. Search
Engines play a huge role in accessibility of information, especially in searching for e-
government content, as they are often the primary source of information gathering for
users despite not offering dedicated access to such content (Freund & Berzowska 2010).
In a series of studies in a Canadian e-government context, evidence was found that the per-
ception of a document's usefulness is influenced by the purpose of the task and genre of

the document, that is the purpose or topic with which the document is associated (Freund & Berzowska 2010, Freund 2013). Task purpose includes fact-based, which provides a clear and specific goal, that users utilise in judging document relevance successfully (Freund & Berzowska 2010), learning tasks, which are topical, are well supported by genres and encourage the browsing behaviours seen in exploratory search (Freund & Berzowska 2010, Freund 2013), whereas problem solving tasks are poorly supported by static documents and would be better suited to situational circumstances (Freund & Berzowska 2010) and a more dynamic communicative environment (Freund 2013). Aham-Anyanwu & Li (2017) investigated user engagement with governmental digital services and found that one of the most influential factors was the content and, more specifically, how long documents were and how complex the use of language within the documents was. Burroughs (2009)'s research aimed to overcome barriers to citizens' ability to access e-services in South Africa and concluded that awareness of, and sensitivity to, the user's native language are crucial variables in how well such a service is used by those who "*do not speak a 'world language' (such as English)*". Nam (2014) provides a comprehensive overview of e-government use in the US, based on an extensive literature review of e-government determinants and a quantitative study of secondary data from the Pew Internet and American Life Project survey. The study identified that the largest proportion of use was for policy research (information about a public policy or issue), with the other highest constructs regarding service use (researching what services a government agency provides, downloading government forms and renewing driver's licences). The results of the study may be skewed, however, due to the large proportion of policy researchers rather than citizens who make up the e-government user base, a fact the author acknowledges. Despite this limitation it is worth noting that the information aspect of e-government use was some of the lowest scoring constructs for use with recreational or tourist information an exception. Those studies that are contextually based within the United Kingdom, are qualitative in nature, in the form of literature reviews (Dwivedi & Williams 2008) or based on quantitative studies that are self-reported, such as the work by Kolsaker & Lee-Kelley (2008), who conducted a postal survey with 302 respondents identifying the public's engagement with e-governmental portals. Of these 302, 216 used such facilities

and 86 did not. Users and non-users alike acknowledged moderate value for the purposes of acquiring knowledge and communicating, despite low levels of interest. There was little perceived value in e-government as a facilitator of democratic engagement, however. Alternatively, works are based on studies of **if** (technology acceptance, perceived usefulness or reasoned action) (Carter et al. 2016) rather than **how** e-government are used by citizens. The extant research could also be perceived as outdated, as these studies were published some ten years ago (Dwivedi & Williams 2008, Kolsaker & Lee-Kelley 2008). Given the evolution of e-government, and the UK government's drive for e-governance, in line with other governments worldwide (Anthes 2015), which culminated in the "Digital by Default" campaign (Freeguard et al. 2015) this is somewhat surprising.

2.6   Summary

This chapter presented extant research and the current state of knowledge in the fields of Information Interaction (more specifically Information Searching), English as a second language user studies and e-Government use. Review of the literature has identified that little research explores how ESL users interact with and search for content, especially in a UK e-Governmental context. Although there are similar studies, albeit from a non-UK context, these predominately focus on user engagement or technology acceptance, and rely on self-assessed methods of data collection, such as questionnaires rather than experiments, field studies (direct observations) or interviews. These studies also lack exploration into if and how users interact with e-government systems.

This research aims to address the gaps in the literature by exploring if and how ESL users search for information in an UK e-governmental context through more than just self assessed data collection methods.

The following chapter will outline the methodological choices that shaped the research design in line with the gaps in knowledge that this review has identified, and the research aims and objectives.

Chapter 3

Research Methodology

3.1   Introduction

There is significant importance placed on the consideration of methodology due to the multitude of ways in which a problem can be investigated. This section will discuss those methodological choices to achieve the objectives as outlined in section 1.3. Following the structure of the research 'onion' (Saunders et al. 2016) it will begin by detailing the philosophical viewpoint underpinning the research, focusing on the epistemological and ontological perspectives that have shaped methodological choices. This will be followed by the research strategy and data collection methods employed which will be discussed as part of each individual phase of study in conjunction with the research objectives.

3.2   Philosophical Perspectives

The philosophical perspective of the research was shaped by the aims and objectives and by the answering of the research problem and question (Cohen et al. 2018, pp.9). As the objectives of the research focus on identifying and comparing how ESL and native English language users interact with search systems and establishing their attitudes towards these interactions for future design, the philosophical perspective was required to be open to the subjective nature of participant views. It was also the purpose of this research to quantify the interactions to gauge their extent, and explore the 'how'rather than the 'why'as seen in previous studies (Rózsa et al. 2015). A positivist worldview reduces knowing down

to that which can be observed (Cohen et al. 2018) and that the researcher and the investigated are independent of one another (Pickard 2013). This worldview would limit the extent to which the objectives could be achieved, as it would not recognise the participant perspective or the researchers role in the collection of those views. Alternatively, an interpretivist perspective, which is focused on the subjective experience of the individual and that the result of the research is a product of the interactions between the researcher and the researched (Pickard 2013). This could be considered but would limit the methods to which the participant interactions are observed or is able to be quantified. A suitable solution is that of the post-positivist worldview which provides a philosophical basis for research that employs both qualitative and quantitative data to provide a comprehensive understanding of a research problem (Pickard 2013, Creswell 2014). In this case this is best suited to meet the research' aim and shall be the adopted perspective to shape this research.

3.3 Methodological Choice

Quantitative research, alternatively, is the collection and analysis of objective numerical data from empirical observation and measures (Creswell 2014) for the purposes of hypothesis testing, generalisation, identifying patterns and isolating and controlling of variables (Cohen et al. 2018). A solely quantitative approach would provide means to measure and compare the proportions of participants' behaviours, intentions, attitudes and knowledge numerically, in line with research question one and two, while not accounting for the identification of their own needs, providing explicit explanations of their behaviours and proffering recommendations in line with research question three. Qualitative research identifies the human aspect of information interaction by exploring the attitudes, behaviours and experiences of participants through the collection and analysis of observed and non-observable phenomena (Dawson 2009, Cohen et al. 2018). Equally, a wholly qualitative study would be rich in detail for the description of the phenomena being observed, but would lack the statistical evidence required to compare and evaluate user interactions systematically.

An integration of Qualitative and Quantitative research to investigate the same re-

search question, referred to as Mixed Methods Research (Pickard 2013), is advocated if use of either independently does not provide the opportunity to best understand the problem (Creswell 2014). As such, it is widely accepted that mixed methods combine the benefits of both approaches while counterbalancing the limitations of each (Feyerand, 1975, as cited by Pickard 2013, pp.14, Dawson 2009, Bryman 2012). This has seen the rise of applications of mixed methods as a popular methodological choice (Creswell & Plano Clark 2011, Cohen et al. 2018) and has been successfully implemented within the fields of information seeking and behaviours (Kuhlthau 1991, Case 2012, pp.267).

A partially integrated mixed methods design utilises both quantitative and qualitative methods but at particular phases of the research (Saunders et al. 2016) with the intention that results from the initial phase help inform the next phase (Bryman 2006). This allows for a broader understanding of a research problem within a specific context (Creswell & Plano Clark 2011), this is intended to meet the objectives set out in **[RQ1]** and **[RQ2]**, and multiple perspectives to that problem (Cohen et al. 2018, pp.195), which will address **[RQ3]**. The research design will be explained in more detail in the following section.

3.4   Research Strategy

This section will outline how the research was conducted in light of the methodological choice of a multi-phase approach and in line with the aim and objectives of the research (Saunders et al. 2016).

The first phase incorporated a qualitative design to provide context and community relevant search tasks rather than making unnecessary assumptions about what may (or may not) be of interest or use to the study participant population. In this way users are able to self-identify their information needs, requirements to meet those needs, and how they interpret their own reality (Bryman 2012) in relation to what constitutes governmental services as well as what systems are pre-existing. Employing pre-existing test collections or obtaining suitable tasks from the literature had been considered, however, there are a distinct lack of similar studies (as detailed in section 2.5). Test collections that most closely relate to this topic include TREC's GOV2 collection (Clarke et al. 2004), however, the documents are from a US government perspective and pre-date the digital by default

initiative by some time, thus are not deemed suitable for the purposes of this research.

This was proceeded by a second phase of embedded mixed methods, which is the process of embedding a qualitative strand into a quantitative design (Creswell & Plano Clark 2011). This provides triangulation by observing findings from multiple perspectives (Creswell 2014, Saunders et al. 2016). This initial quantitative phase incorporated an experimental strategy by observing and testing the information interactions of participants within the context established in phase one whilst addressing **research question [RQ1]** and **research question [RQ2]**. The qualitative strand employs a survey strategy to determine the participants experiences and perceptions (Chu et al. 2012), empirically supporting the findings by providing participants perspectives of their interactions whilst also collecting recommendations for future design, thus concluding **research question three [RQ3]**.

3.5 Qualitative Phase

This section will detail the approach, data collection methods and research agenda of the qualitative (first) phase to establish context to be used within the second embedded Mixed Methods phase.

3.5.1 Participatory Approach

Rather than making assumptions about the state of e-Governmental systems in the UK based on personal anecdotal evidence, while also projecting that same experience on those users whose native language is not English, the decision was made to set contextually relevant search tasks for users to conduct while interacting with those systems. Although the topics these tasks would address could be unilaterally posed, such development of tasks pose problems with task engagement and performance, in terms of interest and relevance to the participant (Borlund 2013). To address concerns about task context, and to enable users to engage in system development through recommendations, the decision was made to employ a participatory approach which has been advocated in information behaviour studies (Hepworth et al. 2014).

Participatory Action Research is used to identify, design and develop solutions to real-

world problems in a collaborative way (Greenwood & Levin 2007, Saunders et al. 2016). This involves the posing of problems and does not seek to just solve them (Power & Naysmith 2005). Bryman (2012) characterises it as a practical approach, which addresses a specific community problem. Its goal is to understand the world through change, whilst learning about improvements through the effects those changes make (Power & Naysmith 2005). It has been widely adopted in several fields (Reason & Bradbury 2008) by facilitating the identification of user needs and developing relevant and validated systems in association with the users (McDonagh & Coghlan 2001, Millerand & Baker 2010, Lau & Stille 2014) whilst taking into consideration their expertise and knowledge (Cornwall & Jewkes 1995, Walton & Pickard 2015). This is achieved by endorsing the participative nature of action research and involving participants in formulating problems and identifying solutions with the view of improving the research process and participants' situation (Reason & Bradbury 2008, Barbosa Tavares et al. 2011). However, projects that are not participatory have been found to be just as valid (Bentz & Shapiro 1998), and of use to the participants (Elmore 2017). Thus, it has been utilised in several studies in obtaining the information needs, requirements to meet those needs and behaviours of people (Barbosa Tavares et al. 2011, Lau & Stille 2014) and has potential to be utilised in an Information Retrieval setting (Ford 2005, pp. 92).

The concern in employing Participatory Action Research in this project is the lack of Action in the research cycle. To explain, in this research the intentions are to provide insight and recommendations for future system design. In a typical Participatory Action Research approach this would make up one cycle following the application of the findings, with multiple cycles following to test and re-test these insights and recommendations over numerous iterations (Reason & Bradbury 2008). In this case, this was not possible due to timescales for the project, and system accessibility, that is, this project is not in conjunction with or advocated by the UK government, local governments or subsidiaries, and therefore any recommendation would not be implemented by the researcher. Although it has been advocated by Bentz & Shapiro (1998) that the approach can be utilised without action, an alternative participatory method needed to be considered. That said, it was feasible that the researcher could formulate search task scenarios

that were deemed relevant, however, as a UK native and English speaker, these tasks may not be as such to the target population. As a result, it was still the intention to adopt a participatory approach, as it provides an opportunity to incorporate the experiences and issues of the study population into the research design, thus increasing its relevance and accuracy (Borlund 2013). Participatory design is an approach that is built on user involvement (Johnson 1998). The method was born out of the applications of action research into computer system design (Schuler & Namioka 1993) and draws on a number of methods, such as observations and interviews, with outcomes co-interpreted by the researcher and the participants who will use the design (Schuler & Namioka 1993, Spinuzzi 2005). The research design is flexible, as such multiple methods can be employed, but typically follows the process of initial exploration; discovery processes and prototyping (Spinuzzi 2005). Initial exploration begins with the researcher and users communicating and familiarising themselves to identify initial aspects of the system including technologies used, procedures and routine. While the Discovery process identifies and clarifies user goals and values, while establishing a shared vision of the end product. Finally, Prototyping is the process of the researcher and user iteratively shaping the artefact to fit the end goal, in this case establishing the search tasks (Spinuzzi 2005). Participatory design has been employed in a multitude of different contexts (Halskov & Hansen 2015) including governmental information systems design research (Oostveen & Van den Besselaar 2004, Axelsson et al. 2010) and seen a rise in the study of information behaviours (Greifeneder 2014, Hepworth et al. 2014). Participatory design has also been employed as part of a mixed methods design with Petrelli et al. (2004) employing it in the development of a cross-language information retrieval system. To the best knowledge of the researcher it has not been applied in the development of search tasks but due to its flexibility, Participatory Design was considered a suitable approach because it advocated the inclusion of the participant in the design of artefacts, in this case contextually relevant search tasks, meeting the requirements for the study, with the participants also involved in the testing of said tasks, and given opportunity to provide feedback implicitly through their performance and explicitly through their post-task and post-study feedback.

3.5.2 Research Design

To initiate the exploration and discovery aspects of Participatory Design (and any participatory approach) it is important to facilitate communication, collaboration and participation (Reason & Bradbury 2008) which can be achieved by developing a supportive environment that is conducive of trust to endorse shared perspectives and participant engagement. To this end a focus group was used, and a participatory workshop (Chambers 2002) organised as it is an approach which has proven successful in other participatory approaches (Barbosa Tavares et al. 2011, Walton et al. 2018) and has advocated by Spinuzzi (2005) andHepworth et al. (2014). A preliminary schedule for the workshop was produced based on the works of Barbosa Tavares et al. (2011) as part of the ethics process (subsection 3.6.14). However, to accommodate participant availability and to adapt to the data and group dictated a flexible approach to scheduling (Kemmis et al. 2013). The preliminary schedule can be viewed in Appendix A but the eventual agenda can be seen in Table 3.1. When the topic was raised with the participants during the opening of the workshop, they opted for the selected agenda due to a lack of time and availability as the major determinant for their choice. A comprehensive outline to the selected agenda is available in Appendix B, which was used as prompts for the researcher, and findings on phase one are detailed in full in section 4.4.

Exploration and Discovery Activities	Data Collection Method
Introduce the research	Explanation
Participant introduction	Presentation
Group values & rule making	Brainstorm
Identify problems & narrow topic	Cards
Cause & effect to establish information needs	Cause & effect diagram/discussion
Survey information needs - classify/remove redundancies	Group work
Evaluate & reflection	Focus group
Prototyping Activities	
Design Search Tasks	Researcher only
Introduce experiment	Presentation
Information interactions	Experiment
Survey information seeking behaviour	Focus group
Reflection & recommendation	Focus group
Evaluate & reflection	Focus group

Table 3.1: Participatory Design Research Design

3.5.3 Data Collection

Data was collected by multiple methods, using a number of different mediums including white boards, post-it notes and flip chart paper. Discussions were recorded using Morae Recorder on a laptop and the researcher also made observational notes, where possible.

3.6 Mixed Methods Phase

This section will discuss an overview of the research methods used in this phase, providing justification for there inclusion.

3.6.1 Experiment

An experiment is the controlling of conditions and judging the effects elements (independent variables) have on control elements (dependant variables) (Cohen et al. 2018). In studies of Information Interaction participants are required to carry out the same simulated search task which is the focus of the study. These can include searching for documents to resolve a specific request or judging the relevance of returned documents (Fidel 2011). The experimental conditions can be in controlled (laboratory), quasi-experimental or naturalistic settings. In a controlled setting all conditions are accounted for in an artificial setting, so that variables can be isolated (Cohen et al. 2018), whereas a naturalistic setting is in which no control is implemented and observations are made in the field in natural settings (Fidel 2011, Cohen et al. 2018). In this research a quasi-experimental setting was preferred, where certain elements are controlled but other elements were natural (Cohen et al. 2018). To ensure the generalizability (the validity of the conclusions outside of the studies context and transferability of the findings to a new context (Pickard 2013, pp.21-22) of the findings in line with the research aim, it was imperative the participants interacted with live systems, such as Google and the UK governments website (www.gov.uk), rather than experimental search systems and test collections, as such an element of control was conceded, and the quasi-experiment adopted. Due to the researchers lack of experience with such methods the experimental phase first began with a study, as detailed in chapter 5, with the aim that this would create baseline results and sensitise the

researcher to a fuller experiment which is detailed in chapter 6.

3.6.2 Questionnaire

Questionnaires (survey) gather information from a research population through the questioning of participants and are the most popular tool for data collection (Pickard 2013). An example being background questionnaires, which provide an insight into participant characteristics such as demographics, education and experience. These are then used to co-locate those participants in relation to others with similarities (Patton 2015). The adoption of this data collection method is especially commonplace within studies of information behaviour (Fidel 2011, pp.61) due to their low cost, reliability, quick and easy dispersion, and relative ease of use, it allows for a larger sample of data than could be offered from alternative techniques (Pickard 2013, Cohen et al. 2018). The medium by which the questionnaire is delivered is varied and can be paper based or digital (online) amongst others providing relatively quick methods of delivery although this comes with limitations in the form of low response rates or partial completion (Cohen et al. 2018). As this research only includes participation within a quasi-controlled environment the questionnaire was self administered in the presence of the researcher. The role of the researcher in this instance was to offer support and guidance although it was important that the questionnaire is clear and unambiguous to ensure a quick, full and correct completion (Pickard 2013, Cohen et al. 2018). It has been noted that a disadvantage to the questionnaire is their lack of direct interaction with participants (Pickard 2013). This is not a concern for this research as other interactive methods are also employed, as such the questionnaire was utilised, with closed dichotomous, multiple and scaled questions used across all questionnaires. Development of the data collection tools is detailed in subsection 3.6.10.

3.6.3 Focus Group

Focus groups provide an opportunity to bring together a collection of people to collect a variation of perspectives and explanations on a phenomena (Pickard 2013). In comparison to interviews, they allow a social aspect to the proceedings, and an opportunity

to engage in meaningful discourse often focusing on a specific issue or question (Cohen et al. 2018), especially in the case for evaluation research where they are used for needs assessments, and in summative assessment to gather feedback on user experience (Patton 2015, pp.477). The focus groups employment at any stage is further supported by Pickard (2013) and are seen as a timely way to produce a large amount of focused data which can be used to triangulate with other forms of questionnaire and observation data (Cohen et al. 2018). Despite their advantages, focus groups do not offer as much data as a one-to-one interview with all respondents where researcher and participant can delve into an issue individually (Cohen et al. 2018). However, this is time consuming and, in this research project, would have had to have been scheduled after the experiment, missing the opportunity for participants' immediate reflection. It was felt that the focus group offered a suitable compromise and to that end they were used in this research with open questions developed and a semi-structured approach used.

3.6.4 Thematic Analysis

Guest et al. (2011) describes thematic analysis as a useful, and commonly applied, method of identifying and discussing complex meaning from a body of textual data. By developing codes that convey implicit and explicit meaning which has been extracted from the text, themes can be assigned which best represent that extraction (Patton 2015). An inductive approach was taken to theme generation, with no predetermined themes formed, and each theme developed as the analysis unfolded. Thematic Analysis is a tool used to identify real-world problems (Guest et al. 2011), therefore, the six stages of Braun & Clarke (2006)'s framework were followed;

1. Familiarising with data;

2. Created initial codes;

3. Search among codes for themes;

4. Examined themes;

5. Defined and named themes;

6. Produced the final results.

These stages shall be discussed in more detail as part of the process explanation at the findings section in section 7.2.

3.6.5 Coding

Multiple strategies were used to maintain credibility, dependability and confirmability during the coding and analysis phase (Pickard 2013, pp.21-22). Guest et al. (2011) advocates the review of codes as one individual may bring bias to the analysis. Therefore, a colleague familiar with the method, assessed the transcripts and codes for quality and trustworthiness, followed by a discussion whereby revisions were proposed as was necessary. No physical record was kept of the inter-coder reliability (which is in hindsight best practice (Pickard 2013)) with both the researcher and reviewer revising the codes together to create the final list as detailed in Appendix E. Another strategy used was "member checking" which is the process of participants reviewing summarised data to ensure that it is a true reflection of their intentions and meanings (Guest et al. 2011, Creswell 2014). In this case one member of the ESL group and one member of the native English language group reviewed the themes and findings of chapter 7 to ensure credibility. It has also been acknowledged that the use of NVivo software for coding of the data is a means to maintain trustworthiness (Welsh 2002) due to the accuracy of its search facility. As a result, the transcriptions were typed up and then uploaded to NVivo 10 and coding of the data conducted both manually and systematically through the software to ensure the data was comprehensively interrogated. With the aim to improve the quality and trustworthiness of the analysis and subsequent conclusions (Pickard 2013, pp.279).

3.6.6 Log file

Use of log data is synonymous with Information Retrieval studies (Jansen 2006) and offers substantial evidence on participants' search activities (White 2016) but is limited when establishing context in the use of the search facility (Aula et al. 2005). Although perhaps viewed as being a poorer method than that of direct observation (Ingwersen & Järvelin 2006), it was preferred due to a desire to obtain both anecdotal (from non-observed pre-

vious experiences) and self-reported assessment of behaviour (Rózsa et al. 2015, Weber et al. 2018) as well as query log information from the sessions. Search log data can be convoluted and noisy and reveals little of the rationale behind user behaviour (White 2016), so, employing log file analysis as part of a mixed methods approach is tried and tested both within the Information Science field (Byström & Järvelin 1995, White 2016) and in previous ESL research (Kralisch & Berendt 2005, Chu et al. 2012). The log file was derived from a lab experiment with screen recording equipment, with the data manually recorded based on the observed interactions (Russell & Oren 2009) to gather a rich data set of users information searching. The process required methodical tagging of recordings with markers listed in Table 3.2. Metrics were then derived from these markers which will be discussed as part of the phase two findings in subsection 5.3.2.

3.6.7 Think Aloud

The think-aloud method allows users to speak as they interact with the system during the experiment. The justification for this is that it provides a deeper understanding of the cognitive processes the user employs by encouraging them to vocalise their actions (and the reasons for doing so) giving a richer insight into their interactions (Van Someren et al. 1994). An alternative method, is that of talk-aloud, whereby the participant only describes their interactions without providing any other insights (Ericsson & Simon 1980, Ingwersen & Järvelin 2006). Although, perhaps more objective, the aim of this method of data collection is to gain insight into participants decision making for document selection. Therefore, think-aloud is the preferred method. It is tried and tested as a tool for aiding understanding and maintaining engagement in the task (Park et al. 2014) which has been utilised in numerous other studies across a wide range of topics and fields including (but not limited to) ESL and digital literacy (Ebner & Ehri 2013), task based information retrieval (Vakkari 2001) and online information seeking (Hoppmann 2009).

3.6.8 Task Development

Rather than giving users a set of tasks to retrieve web documents from a test collection such as CLEF or TREC, as is common in Information Retrieval research (Hansen

Log file Markers	Definition
Quote	A quote from the users talk-aloud data
In site search	An instance of the participant using a websites in-site search feature
In site click	An instance of the participant clicking on a navigational link within a web document (not a SERP link)
Search query	An instance of the participant beginning or ending an original search query
Reformulation	An instance of the participant beginning a search query reformulation
Doc start	The time a web document loads for the first time and that document session starts
Doc end	The time a web document is closed to end a document session
Participant needed help	An instance of the participant asking a question during the study
Participant prompted	An instance of the participant having to be prompted during the study
SERP start	The start time after a SERP had loaded
SERP click	An instance of the participant clicking a SERP link
Web Page Change	An instance of the participant switching between web documents
Observation	Researcher observational note
Bookmark	An instance of the participant bookmarking a web document
Error	An instance where an error occurred in the study resulting in data loss

Table 3.2: Log file marker definitions

& Karlgren 2005, Jiang, He, Kelly & Allan 2017), it was decided to develop a set of contextually-relevant tasks for the participants to complete in a more natural online setting. In line with recommendations to gather information and verify the characteristics of the users (Borlund 2003*b*), the first phase study utilised participatory design to identify 'real' information needs of English as a Second Language users and the requirements to meet those needs through the use of UK e-government services. The search tasks are designed to reflect realistic information seeking situations in an attempt to be relevant and a more interesting search experience for the participants (Kelly et al. 2015, Edwards & Kelly 2016). Due to concerns about multiple contributors towards the PhD, the researcher

solely formulated each task by following a cognitive complexity framework (Kelly et al. 2015), whereby multiple task descriptions were formulated for each topic in line with the tasks cognitive complexity, with one task then selected per topic. The original framework included six complexity levels, with only five being utilised for task creation as they were unable to create distinct search tasks for that category than from the other categories. In the same way for this research not all complexities were used. Two complexities were discarded, *Remember* and *Apply* leaving four remaining, as detailed in Table 3.3.

Understand	List (Set)	Constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarising, inferring, comparing, and explaining.
Analyse	List (prioritised) Description	Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organising, and attributing
Evaluate	Recommendation	Making judgements based on criteria and standards through checking and critiquing
Create	Plan	Putting elements together to form a coherent or functional whole; reorganising elements into a new pattern or structure through generating, planning, or producing

Table 3.3: Table showing the task complexity descriptions adapted from (Kelly et al. 2015)

The *Understand* task requires the participant to compile a list or factors from an information source, potentially from multiple sources if required. The *Analyse* task requires the participant to compile a list and describe it to show understanding. The *Evaluate* task requires the participant to compile a list, understand the differences between the items to provide recommendations. The *Create* task is setting a plan, the participant follows the same steps as the evaluate task but the participant must generate something. As was the case in the original study, the researcher also struggled with developing sufficiently distinct and complex search tasks for two of the topics, in part due to the subject matter. Although this appears quite vague at this time, it shall be explained in more detail in section 5.2, which discusses the task development once it has been established what the topics are in subsection 4.4.7.

Ideally, these tasks would have been developed in collaboration with the participants, and it has since been identified that this could have been possible, and although this could raise questions about task relevance, findings suggest this concern is unfounded (see subsection 6.2.3). Increased participant collaboration in the formulation of search tasks is

raised for future works in section 9.3.

3.6.9   Experimental Conditions

To maintain a level of control the four search tasks (see below) were allocated using Latin squares to negate fatigue, learning effects and minimise task-bias (Cohen et al. 2018) (see Appendix D for a list of the task allocations). The system allows the user the chance to review the task at any time up to completion. Development of the tasks will be discussed in section 5.2.

The studies were conducted in experimental conditions in that they took place in a controlled environment (rather than allowing users to participate at home), utilising PC's to conduct the study. This was due to software requirements for screen recording. To allow the users to search for information in as naturalistic a setting as possible they were able to interact with information on the web (Spink et al. 2001). The only stipulation is that they had to start each task from Google[1]. This online Search Engine was selected from many as it allowed for standardisation across the study. This is because each Search Engine utilise different search algorithms which evaluate and retrieve online documents in a different way. Users were not required to login to any online service (such as a Google profile account) to minimise the role personalisation would play, that is the tailoring of search results and advertising based on a user's search and interest profile.

3.6.10   Tool Development

The pre-study questionnaire collected background information on the participants' (Patton 2015) including their area of study; age; gender; nationality; language(s) spoken and proficiency; IT use; search engine use in English and their native tongue; search engine competency and preference and their own UK governmental service experience can be found in Figure 3.1.

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[1]specifically www.google.co.uk

Pre-questionnaire

Full name					
Age		Gender	Male ☐	Female ☐	
Nationality					
Study programme & faculty					
Language proficiency (please tick below)	Native (L1)	Fluent (L2)	Competent (L3)		Basic (L4)
English					
Please Specify other Languages below:					

Please tick the most relevant response.	Daily	Few times a week	Weekly	Monthly	Rarely
I.T. use					
Search Engine use in English					
Search Engine use in native language					

Please tick your confidence level (1 = very confident, 5 = not confident at all)					
	1	2	3	4	5
Formulating search engine queries in English					
Identifying relevant search results					
Identifying relevant information from websites					

Search Engine preference (please tick)	Google ☐	Bing ☐	Yahoo ☐	Ask ☐	Other ☐ (Specify below)

Have you used UK governmental e-services before? (please tick)	Yes ☐	No ☐	Unsure ☐

If yes; for what purpose? If no or unsure, why? (give brief explanation please):

☐ I wish to be made aware of the results of the study (please provide contact email address below).

....

I understand the purpose of this research and agree to participate

Signature: ....

Date: ....

Figure 3.1: Pre-Study Questionnaire

Prior to beginning each task, participants were asked to fill in a pre-task questionnaire (Edwards & Kelly 2016) (see Table 3.4) to gauge their domain knowledge, interest in the topic and the perceived difficulty of the task using a five-point Likert scale where 1 is "Not at all" and 5 is "Very".

At the end of each task the participant was also required to complete a questionnaire to record their reflective view on the tasks and their performance, with questions adapted

Q1	I have searched about this topic before
Q2	I know about this topic
Q3	I am interested in this topic
Q4	It will be difficult to find information about this topic

Table 3.4: Pre-task questions.

from previous works (Johnston & Webber 2003, Bell & Ruthven 2004, Kelly et al. 2015, Collins-Thompson et al. 2016, Edwards & Kelly 2016) as shown in table Table 3.5. Responses were on a five-point Likert scale where 1 is "Not at all confident" and 5 is "Very confident".

Q1	I was given enough information to complete the task.
Q2	It was clear what was being asked.
Q3	The task was relevant to me.
Q4	The task was easy to understand.
Q5	I was engaged in the task
Q6	I performed the task to the best of my ability
Q7	I found the task difficult
Q8	I am confident the content I found satisfied the task
Q9	I am confident about the search query terms I used.
Q10	I am confident I identified relevant websites
Q11	I am confident in my ability to read the website content
Q12	I am confident in my ability to understand the content of the websites I visited
Q13	I am confident the search task was completed.

Table 3.5: Post-task questions.

Post study Discussion

Semi-structured focus group discussions were conducted immediately after each experiment (and included all participants from that experiment) to elicit self-reported behaviours and participants anecdotal evidence, in the form of past experiences and knowledge, with a question asked to the group and opportunity provided for all to respond (Guest et al. 2011, Patton 2015). Additional unstructured questions were also asked to delve further into a topic or comment made to guide the discussion, if drastically off topic. Questions were also directed to participants who had not contributed through the discussion, to counter any one participants dominance (Guest et al. 2011), before moving on to the next.

If any points had already been addressed before a particular question came up, rephrasing took place if further responses or clarification were necessary, otherwise the next question was asked. This process was repeated until all question topics had been covered. The structured questions are detailed in Table 3.6.

Tasks	
Q1	Were these tasks relevant and the scenarios believable?
Q2	How would you tackle similar scenarios outside of this experiment?
Systems	
Q3	What did you like about the experience?
Q4	What did you dislike?
Q5	What feature (if any) was helpful?
Q6	What feature (if any) would you like which was missing?
Website Observations	
Q7	How difficult is to differentiate between government and non- government websites?
Q8	What were the main differences?
Content	
Q9	How easy to read was the material you found?
Q10	Did you find the material easy to understand?
Recommendations	
Q11	Possible solutions to the issues you found on content?
Q12	Possible solutions to the issues you found with user interfaces?
Q13	Possible solutions to the issues you found with assistive functionality?
Q14	Possible solutions to the issues you found with the service as a whole?

Table 3.6: Post Discussion questions.

3.6.11 Research Strategy Overview

Due to the multi-phase and integrated mixed methods approach to this research strategy may appear confusing. This subsection shall clarify, briefly, the steps taken. For a clear visual representation of the research strategy see Figure 3.2.
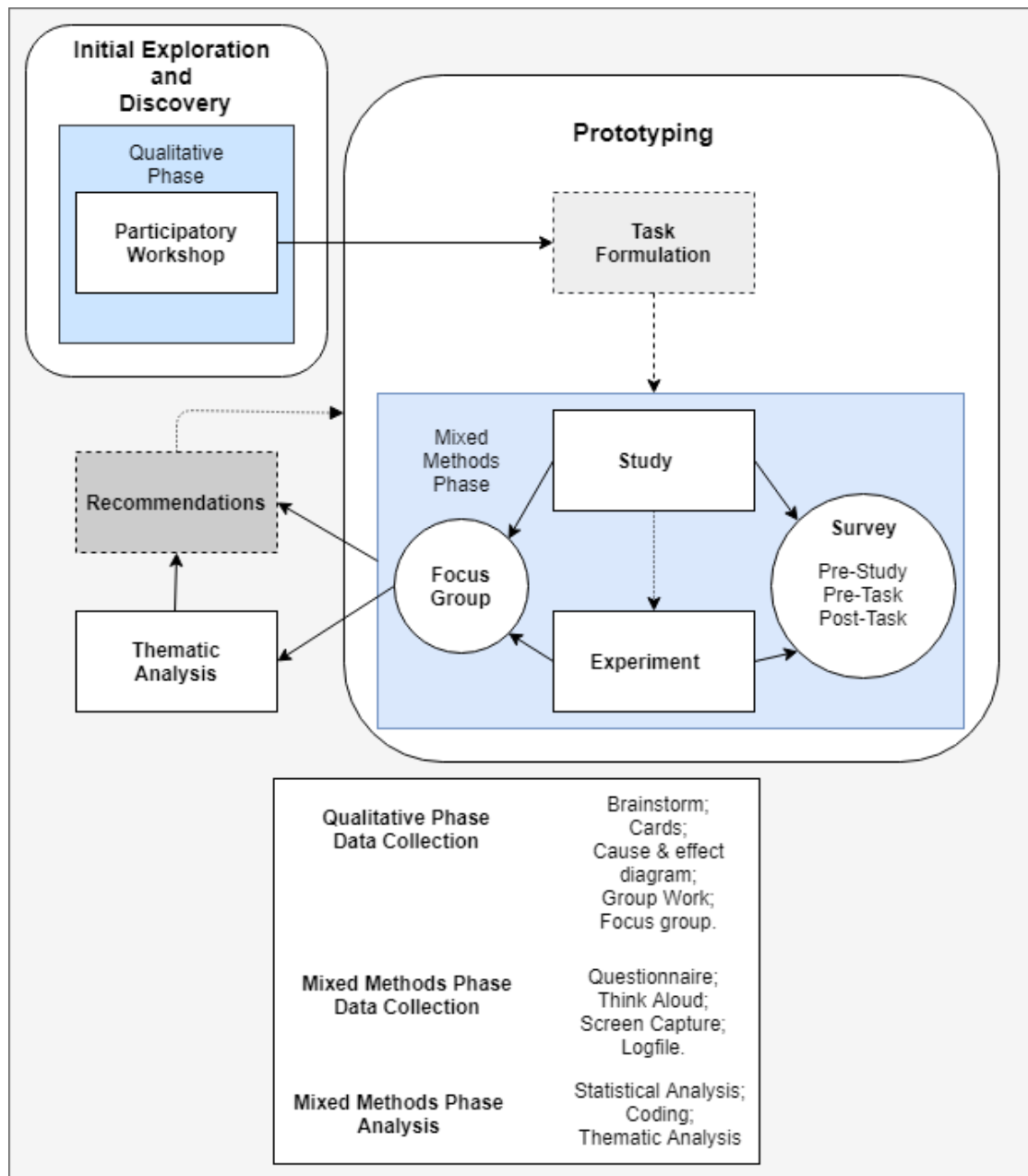
Figure 3.2: Research Design Model and Methods

During Phase One (chapter 4) the Participatory Design approach will utilise a number of data collection tools, namely: Brainstorming; Cards; Cause and Effect Diagrams; Group Work and Focus Groups. Findings from this phase will inform phase two and the task development which shall be utilised in the experiments which make up study 2 (chapter 5) and study 3 (chapter 6). These experiments will use questionnaires, think aloud and focus groups for data collection. Analysis of the data will use Log file, Statistical and Thematic Analysis. Findings from the post study focus groups, and thematic analysis, will make up the recommendations (chapter 7), which will conclude phase one.

3.6.12 Sampling

As the research has a specific sample population, namely, non-native English language users, purposive sampling was utilised for participant recruitment, as it is a non-probability method, aimed at sampling in a strategic way which best addresses the research question (Bryman 2012).

Initially, the intentions were to obtain participants from a number of English as second language course providers in the areas of Newcastle upon Tyne, Gateshead and Durham. Fifteen providers were contacted by phone and email. Following a few positive responses, meetings were arranged with two providers. One of which, Action Foundation, were keen but could not guarantee the commitment of the staff/students as it was a voluntary service and staff were already at workload capacity. Following further correspondence, the provider ceased interest. The other, which was more promising, was a course ran by Westgate Community College. After a number of meetings, the head of ESL teaching advised he would distribute study information to the teaching staff and would feedback likely participants. Uptake by staff to facilitate the study was particularly low, and despite offering to present at taught lessons, to garner interest, the provider also declined to facilitate participants. This was particularly disheartening as the overall process had taken some four months to organise. By this time the academic year was almost over, with students already submitting evaluations and coursework, or having already left the university for the summer. As a result of this, the decision was made to proceed with the participatory approach. In mixed-method studies it is advocated to determine participant numbers based on the methods employed (Kemper et al. 2003) and as there are no strict rules to determine precise participant numbers for qualitative methods (Efron & Ravid 2013) it was expected that one may have to be content to starting work with a small group (Dawson 2009) with a view to expanding as time elapses (Cohen et al. 2018, pp.452). This placed less emphasis on a stated sample size (representativeness) and more on the uniqueness of the group under study and their fitness of purpose towards the study aim. This aim being to identify governmental topics and formulate contextually relevant search tasks. It was important that as the quantitative aspects of the research were undertaken, where rigour and generalisability is sought (Kemper et al. 2003, Bryman 2012, Pickard 2013), that a

larger population be required as the participant sample size lends weight to the phenomena the research seeks to identify or explain, and as the sample size increases, external validity of that explanation also increases (Bryman 2012). External validity being 'the extent to which findings can be generalised in a wider context' (Pickard 2013, pp.22). It was the intention of the researcher for this phase at least 30 participants be obtained, as recommended by Efron & Ravid (2013).

A convenience sample (Boudah 2010) of post graduate research students at Northumbria university were recruited with initial data collection taken during the summer break in the academic calendar. This initial intake, therefore, were participants in participatory design approach (in chapter 4 as well as the study (as detailed in chapter 5 and chapter 7). A second intake was arranged in the new academic year and data collection took place during November and December (as detailed in chapter 6 and chapter 7). Although not the preferred method of purposive sampling due to the limitations it places on population representativeness and generalisability of findings (Patton 2015, Cohen et al. 2018), it is one of the most commonly used techniques due to the low costs and ease of accessibility to populations (Kemper et al. 2003) and is regularly used within information interaction and information retrieval studies (Kelly et al. 2009, pp.67). To mitigate representativeness concerns (Sears & Hanson 2011) it was imperative to determine English language proficiency, demographics and IT literacy levels (Marlow et al. 2008). Initially the requirement for participants to have English as a non or native language was stipulated on the study advert. This was further identified on a closed pre-study questionnaire to determine whether participants were suitable candidates. This has been utilised in similar studies (Rózsa et al. 2015), with users self-certifying their language proficiency. There are, of course, issues with this as users may misrepresent themselves. However, it is a requirement of the Northumbria University that students must have at least a 6.0 on the International English Language Testing System (IELTS) at undergraduate or 6.5 at postgraduate level. As such, it was determined that this guarantee of a minimum level of English language proficiency mitigated the risk of misrepresentation.

3.6.13 Recruitment

A combination of techniques were utilised to recruit participants, with three posters developed for each study. Each was posted both physically on notice boards in main buildings within the city campus, and also posted online[2] which could be accessed by Quick Response (QR) code or directly from each studies unique URL. Email and face to face recruitment was also utilised to maximise exposure of the study. Email requests were authorised by the director of ethics of three out of the four faculties within the university and emails of a digital version of the posters sent by the administrators of the email groups to all Postgraduate researchers within those faculties. It is difficult to determine the successful conversion of this method as recipients of the emails were sent the adverts directing them to the online sign up form. All three adverts were viewed over 1200 times[3] with some 20 participants registered on this platform. The remainder of the participants signed up in person or via direct email to the researcher. Following the agreement to participate, applicants were asked to indicate their availability using an online scheduler[4]. Session groups were then organised based on shared availability, however, several people did not agree to a time slot and were discarded from the pool, while a few others did not arrive at the allotted study and were also discarded. The best method of recruitment was face to face, with the most number of participants who attended recruited this way. Sampling details for each study shall be discussed in the associated chapter.

3.6.14 Ethics

Ethical considerations were of the utmost import (Kuper et al. 2008, pp.689); as such, every effort was placed on ensuring each participant's well-being. Confidentiality and anonymity were at the forefront of these considerations. Participants were made aware at every stage of the study, with a clear and transparent process; of their rights in line with the university's own ethics guidelines and existing legislation. Potential participants were provided with a brief outline about the nature of the study at the recruitment stage, for those who took part, full disclosure was provided in the form of an information sheet

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[2]www.callforparticipants.com
[3]registered members of the callforparticipants website also had access to the advert
[4]doodle.co.uk

and researcher presentation in an informal manner. Participants were also required to complete a consent form (Orb et al. 2001), acknowledging their rights to anonymity, their right to removal from the study and to include any other considerations should they require them. No one opted for additional conditions. Each participant's names were anonymised during the data collation stage, and pseudonyms used, for example, participant A, B, C for non-native English speakers and A1, B1, C1 for native English speakers.

3.7   Summary

This chapter has detailed the philosophical, ontological and methodological decisions that underpin the research design, giving justifications both from extant research and, most importantly, in line with the research aim, questions and objectives. Adopting a post-positivist worldview, that promotes the use of a Mixed Methods Methodology, the decision was made to employ a integrated mixed methods design to meet the research goals. A multi-phase approach was chosen to best address the research aims and objective. The first phase incorporated a qualitative design, through a Participatory Design approach, to provide the initial exploration and discovery of contextually relevant search tasks. This context of which informed the second mixed methods phase utilised to further prototype the search tasks. To do so this phase employed embedded mixed methods, utilising questionnaires and experiments to answer **[RQ1]** and **[RQ2]**. Providing the means to answer **[RQ3]** through recommendations identified using focus groups and thematic analysis. This in turn provides feedback towards the search task development and finalises the participatory design approach.

Chapter 4

Findings: Participatory Design Workshop

4.1 Introduction

This chapter will detail the findings of the first phase study. It will outline the recruitment and sample population, before discussing data collection, topic selection and researcher reflection.

4.2 Recruitment and Sampling

A combination of techniques were utilised to recruit participants, with a poster developed and advertised online[1]. The advert was posted both physically on notice boards in main buildings within the city campus and posted online which could be accessed by Quick Response (QR) code or the URL[1]. Email and face to face recruitment were also employed to maximise exposure of the study. Email requests were authorised by the director of ethics of three out of the four faculties within the university and emails of a digital version of the posters sent by the administrators of the email groups to all Postgraduate researchers within those faculties. Although there were numerous views of the online advert, 7 International PhD students signed up as participants, 6 in person and 1 via direct email. Of these, 6 took part in the session.

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[1]www.callforparticipants.com

4.3 Piloting

As the findings from this phase of the research was to go towards the search task formulation, and be utilised in the study and experiment, the researcher felt it prudent to attempt to anticipate potential topics that may come up in the first phase study. Also, as a means to prepare the researcher and test the methods which would be employed, two groups of two people (UK nationals) were asked to develop a list of possible governmental services (topics). There was a varied list of topics from both pairs for the collected findings:

- Taxation

- Financial Planning

- Jobs/Training

    - language

    - job search

    - work placement

    - training

    - going to college/university

    - other courses

    - public libraries

    - community centres

- Housing/Property

    - area

    - bills

    - taxation

    - rental/purchase

- Find Services

    - school

    - health care

    - government/council

    - library/community services

    - translating docs

    - housing

    - National Insurance number

    - bank account

    - job info /employment centre

    - benefits

    - employee/ tenant info

    - public transport

    - buying things

    - drivers' licence

The breadth of topics that were derived made preparation difficult, however, it set the authors expectation that such a wide and varied list may appear in the actual study. When each pair were asked to establish the most important topic both pairs opted for

different topics. This is not surprising but once again set expectation for what was likely to occur. This established to the author that multiple sessions were likely and that the subsequent study and experiment would take place during these sessions, rather than all in one session, as had been considered. In reflection, this assumption was made with little thought (by the researcher) on just how complex a process search task development and study design could be.

4.4   Process

It was imperative the participants interacted with all members from the moment the study began, therefore, every stage was carefully planned to promote interaction and to develop a group mentality to facilitate discussion. This planning lends much to the research design of Barbosa Tavares et al. (2011) and the works of Chambers (2002) and Walton & Pickard (2015). These works were essential to provide insight into the tasks that would need to be conducted, and the activities and (researcher) mentality and behaviours that would need to be demonstrated to conduct the research successfully. This section shall provide a synopsis of the study, outlining the process undertaken, findings and reflections.

4.4.1   Venue

The session was held in a meeting room within Northumbria University, with a large oval table for discussion, white boards around the walls so participants could write questions and the outcomes of their discussions, space to the side for introductions and ice breakers and a projector for the study presentation. The session lasted around two hours forty five minutes and was held on a Saturday afternoon in May 2016.

4.4.2   Arrival

Upon arrival at the study the researcher welcomed the initial participant asking them to make their own name tag and briefly explained to help themselves to refreshments and to take an initial questionnaire, participant consent form, and information sheet for the pilot study. They were also instructed to pass this information on to the next participant, who

in line would pass on the details to the next and so on until each participant was informed and prepared for the study to begin. This was followed by a brief safety talk, explaining the necessary details in the event of a fire and signposting people to facilities should they be required.

4.4.3 Expectations, hopes and fears

The participants were then asked to highlight what their own expectations of the study and what (if any) hopes and fears they may have with regards to what they may learn or realise. The participants identified their own expectation and what they hoped to get out of the study, with some there to further their own knowledge on the research outcomes, and others there to improve governmental services. Reasons for participation were of a similar ilk, with curiosity, learning, topic interest and being helpful all given.

4.4.4 Presentation

From here the researcher made a brief presentation highlighting the background and purpose of the study. Firstly, discussing the wider PhD project followed by the study context of the UK's drive for e-government services (through the digital by default initiative) and how the participants (as potential users of said services) would identify what kinds of services they thought were available, what users need and want with a view to applying these thoughts and findings to the wider context of the project and future studies. The presentation moved on to discuss the Participatory Design approach, using layman terms so as to not confuse the participants. Explaining that is was an attempt to engage the participant and to enforce the collaborative nature of the methodology all the while stressing the importance of communication between each other as peers (including the researcher). Discussing the outline of the study programme was succinct in an attempt to reduce the length of the presentation (and the power position of the researcher) but also ensured an air of flexibility as the study and its direction is subject to the participant's involvement and could deviate.

4.4.5 Introductions

Although some participants had met previously, once the presentation was finished, introductions were made between the participants with each asked to discuss who they were and a little about themselves. This was followed by some ice breakers (Chambers 2002) which consisted of organising themselves into a line (longest to shortest) based on time it took to arrive at the venue, and clustering - where the group divided themselves based on similarities i.e. their mother tongue; academic discipline, reason for participating and what they had for breakfast.

4.4.6 Group values & rules

The group followed this by establishing their own group values and rules collectively, to set the norms of behaviour and conduct, with a view to promote mutual helping. This was also a vessel for finding suitable methods for restraining big talkers and helping the silent to gain a voice. In the event of misbehaviour they were also asked how they would deal with deviants. All rules were then written on a white board so they were available to see at any time. Initially the participants were wary of this process (see Figure 4.2), using humour to avoid the task and displaying guarded body language. However, after some coaxing participants became engaged, with the humour displayed observable in the established rules detailed verbatim below and seen as written in Figure 4.1:
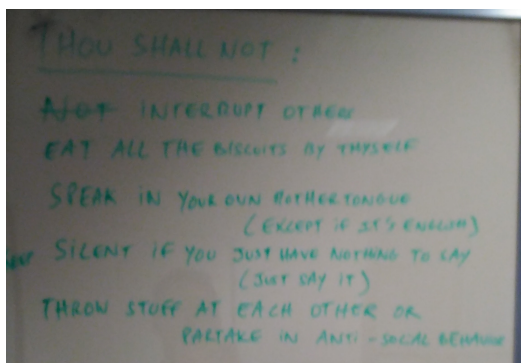

Figure 4.1: Participant' study rules.

Figure 4.2: Participant rule making.

Thou Shalt Not:

- Interrupt others;

- Eat all the biscuits by thyself;

- Speak in your own other tongue (except if it's English);

- Be silent if you just have anything to say, just say it;

- Throw stuff at each other or partake in anti-social behaviour.

4.4.7 Task 1 - Presenting the problem and topic

In the first task, the participants identified topics based on the types of governmental services they felt were important or that they had had direct interaction with. Initially this was done individually with each participant asked to reflect on the task and their own experiences for two minutes, as seen in Figure 4.3. In reflection, this task needed re-explaining on a number of occasions with four participants disengaged and disruptive either on their phones or distracting others with non-pertinent tasks. Despite these disruptions, each participant did contribute.

Figure 4.3: Participant reflection in Task 1.

Figure 4.4: A buzz group in Task 1.

This was immediately followed by a buzz session (see Figure 4.4) whereby the group divided into two groups of three and discussed together what their experiences were, again writing the results on post-it notes. Engagement within the groups was high for this task, although participants needed prompting, regarding making notes, on a number of occasions. Each group's findings were then fed back to the others with the group discussing the overall findings.

Due to the extent of the services available the participants then categorised the services into groups as a collective (removing redundancies) with all post-it notes placed on the table and stuck onto a sheet of flip chart paper (see Figure 4.5). Two participants took
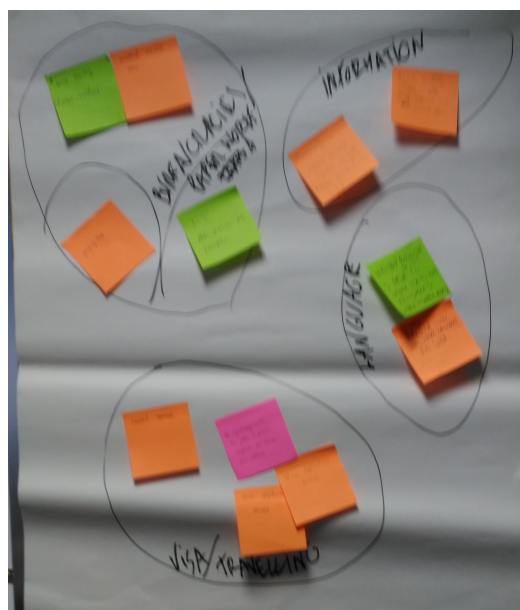

Figure 4.5: Grouped topics.

charge of categorising (after multiple prompts) with the rest of the group then joining in. The group struggled to come up with wording for topic headings, eventually deciding on: Language; Information; Bureaucracy; and Visa/Travelling as seen in Table 4.1.

Bureaucracy		
House Agency	NHS/Medical	Medical Service
Paying Tax	National insurance applications	
Information		
Missing = Services provided by the citizens advice bureau e.g. benefits information		
Ability to notify change in address in all govt agencies in a single online form		
Language		
Written English is easier to understand for newcomers		
Query translation		
Visa/Travelling		
Travel services	Visa application service	
Re-registering with the police in person every time you change address		

Table 4.1: Grouped governmental service topics

Once done, everyone voted for the topic they deemed of most importance which would make up the topic for discussion throughout the remainder of the session. There was a

tie between Visa and Information (customer service) with 3 votes each. As the result was tied, it was decided by voting between them both. Visa won by a vote of 4 to 2. Visa was chosen for a mix of reasons – some voted due to direct impact as it is the "First service we use" and "people can't come into the country or sometimes leave a departing country without the necessary VISA" or voted due to the impact it had to their friends, as they themselves did not have a visa requirement to enter the UK.

4.4.8 Task 2 – Analysing the problem

After a short refreshment break, the participants were given time to reflect on the tasks that had been conducted before it was then decided to evaluate the chosen topic, freely engaging in a group discussion about the problems with this topic (reasons), factors that cause the problem and would bring you to need them (causes) and effects of the problem, why they are there, and what if they are not (effects). One member of the group then recorded the outcomes on flip paper (see Figure 4.6):

Reason;

– Entrance into the UK

Causes;

– Changing information   – Documents required

– Convenient   – Trust info

Effect

– Potential imprisonment.

This required some coaxing from the researcher with no one member of the group initially willing to commit to the position. On multiple occasions it was necessary to clarify what was required to complete the task. It became apparent that the discourse had come to a natural end when saturation occurred with participants repeating discussion points from the topic selection finale (in the previous task), and so the task was ended.
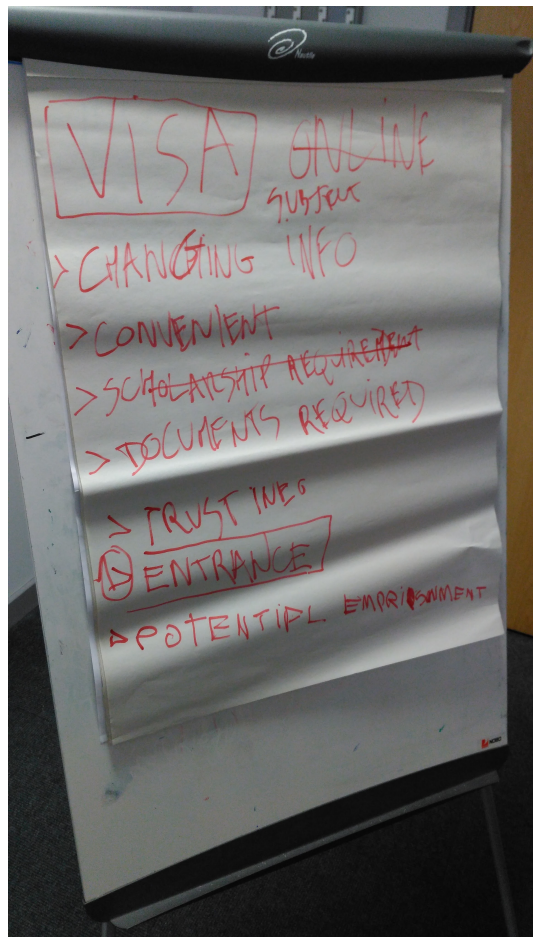
Figure 4.6: Reason, cause and effect chart

4.4.9 Task 3 – Surveying information needs

The group then divided into three pairs to classify the information needs of the user of e-government services, identify the sources of information and skills required to help them address their needs (see Figure 4.7).

These were then documented on individual post-it notes. As a collective the participants collated their findings, and stuck their post-it notes on a sheet, removing redundancies and classifying the importance. There was good interaction within and between groups, with the participants engaged with this task once the purpose was clarified. Grouping was done with the researcher reading out to the group what had been written, and they organised their findings (Figure 4.8). One note was illegible - even by the person who wrote it and was removed. It was self-evident which of the entries were redundancies and were not accounted for by the group.

The final list of information needs, information sources and required skills to resolve

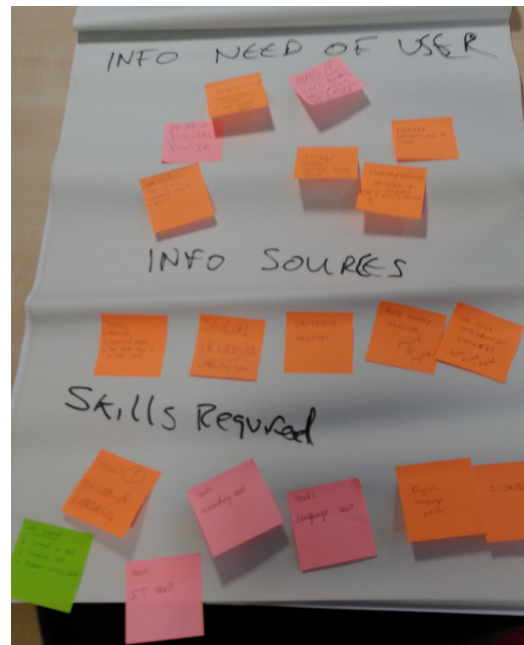Figure 4.7: Participant pairing in Task 3.

Figure 4.8: A buzz group in Task 1.

the needs include:

Information needs

- "Type of visa & study/work/leisure or travel visa "

- "Education of user & Beware of digital divide"

- Documents required

- "Regulations & country of origin of user & UK immigration policy towards it"

Information Sources

      – Websites   – UK website   – University website

Skills Required

- "Internet use & IT skill & e-skills"

- "Language skill & English language skills"

Following the grouping of the information needs, information sources and skills required to obtain these sources, the participants reflected on their findings. From these reflections it was observed that despite identifying online websites (from various sources) as the sole source for visa information, three participants noted that their own visa applications were completed by external companies whom act as mediators. It is interesting to note that they did not mention social networks (both on and off-line) or these external companies as part of the data collection process. Regretfully this was not pursued further with the group at the time, but the author surmises that perhaps it was not considered at the time (in the case of social networks), that it is not something others would consider (if thinking about visa information from a third party perspective) or that access to such services is obtained through "Websites" and so did not need to be explicitly stated.

4.4.10   Reflections and conclusion of the session

As a final reflection, the participants were asked to feedback on the session, to determine their own learning through the process, and to inform the author for future sessions. This section will detail those reflections as well as the authors own considerations.

Location

It was noted that the location of the session was not particularly suitable as the room temperature was commented on on a number of occasions, with the door having to be propped open and a few of the participants removing coats/jackets. At one stage it was observed by the author that one participant fell asleep for a few seconds during a task due to the heat. One participant also commented on the lack of natural light, stating:

"Windows and air circulation makes people more comfortable." (Participant

D)

Tasks

When reflecting on the tasks, participants were surprised that there were no laptops or Personal Computers present and there was no interactive use of e-government services, which had been assumed during the recruitment process. It was explained that this had been raised in the opening presentation, but something that would be addressed in subsequent sessions. This was followed by comments on more instructions needed as some participants found it difficult to determine what was required, with the recommendation of physical materials which could have been useful to stimulate discussion and help those with a lower level of English literacy to understand what was required. Attempts were made to explain that instructions could affect the power dynamic, and potentially stifle the element of flexibility and open discussion but the author concedes, the white boards in the room could have been used to write the tasks down for participant reference.

Discussion

Participants noted that the discussions were of particular interest - especially those that learned Sweden has a centralised ID number which links all services together. Others who did not have visa requirements noted learning about visa access, and that it is different based on nationality/circumstances. Something they hadn't considered before, and were now conscious of, due to its effects on friends and colleagues. The author noted that the participant numbers and the demographics of those participants, unsurprisingly, sway the topic choice. Specifically, there was a larger proportion of participants who had visa requirements, than those who came from countries within the EU and had no visa concerns (at the time). This raised concerns from the author about the validity of the findings, with specific notes made on whether what they (the participants) had discussed would be of interest to other demographic areas/participants.

Participant numbers

Finally, the participants themselves noted that participant re-numeration or reward would have been recommended for better sample numbers. This was also a reflection noted by Barbosa Tavares et al. (2011) but not for the purposes of persuading participants to sign

up (as was implied by the participants here), something the author had tried to avoid, but to recompense for the time and effort the participants had spent in aiding the research process.

4.4.11 Second Phase

To obtain an understanding on the current state of e-governmental services, and to further the prototyping of the search task development, a study and experiment will be conducted to allow users of this study (and other additional participants) to interact with such services in a controlled environment (see chapter 5 and chapter 6), whilst performing search tasks derived from the identified topics from this study (see section 5.2). These interactions will allow these users to reflect on their experiences, their interactions and the study, whilst giving them a platform to proffer comments and recommendations on these services and the tasks, as detailed in chapter 7.

4.5 Summary

Utilising the expertise and knowledge of English as a second language users, this section has identified and detailed the participants knowledge of types of e-governmental services, identifying Visa as the most important. Building on this identification the participants analysed problems surrounding such services, factors that cause the need for the service and the effects of the service. This was followed by identifying the information needs of visa service users, potential information sources and the necessary skills required to resolve these information needs. The following section will detail the study of the second phase, which builds on these findings by exploring the identified topic in the form of online search tasks.

Chapter 5

Findings: Study

5.1 Introduction

This phase was split into two, with a separate (experimental) study followed by an experiment to sensitise the researcher to the method, with this section dedicated to the first with analysis detailed as such, and the experiment analysed in chapter 6. Search task development will be discussed in this chapter, although is also applicable to the experimental conditions in chapter 6, as the search tasks were identical in each case. The study population, pre- and post-task questionnaire results, participant information interactions and researcher observations for this study will be discussed separately. Finally, although occasional reference will be made from post task discussion and be analysed as supporting evidence, chapter 7 will detail post discussion analysis in more depth.

5.2 Task Development

Tasks were derived from the topics identified during the first phase (as detailed in subsection 4.4.7) in an attempt to address Borlunds' concerns over lack of relevance, believability and engagement in the search task context (Borlund 2003*b*). Following the framework for task development as detailed by Kelly et al. (2015) and described in detail in subsection 3.6.8, multiple task descriptions were formulated for each topic in line with the task difficulty, with one task then selected per topic from each of the difficulty levels resulting in four search tasks (Figure 5.1). The full list of tasks developed can be seen

in Appendix C. During task formulation, the decision was made to focus on a range of topics that were identified during phase one, rather than just on visa related tasks, as the visa process (via Gov.uk) was comprehensive and did not offer sufficient complexity but also to ensure tasks were distinct. These additional topics included housing and health, which were identified as part of the Bureaucracy services heading. This was selected over the Information grouping which was voted second most important service, as the topic did not provide tasks of sufficient complexity. The final task, was on the topic of 'digital by default'. The reason for this was that no one participant had heard of the initiative, and finding out about such a topic met the criteria for the 'create' task, in that participants had to put elements together to form a functional whole (Kelly et al. 2015). The topics selected also had to revolve around governmental services that did not require a user to register to complete the task, an example being signing up for child benefit or unemployment benefit payments. Although more realistic, this would have raised ethical issues regarding fake submissions for benefits. Tasks were also written with an element of vagueness and in the third person, in an effort to ensure tasks were inclusive and engaging. The vagueness was to provide users a certain level of flexibility in their interpretation of the tasks and apply their own conditions on the task. For example, asking a non-visa requiring participant (such as some EU nationalities or UK natives) to check what visa is required for themselves could potentially disengage the participant, negating the efforts of addressing Borlunds concerns (Borlund 2003*b*), therefore asking these users to search on behalf of a friend allows them to engage in a task that could happen in reality.

5.3   Experimental Conditions

Each task was allotted ten minutes for completion (Kelly et al. 2009, Kim 2009). There were concerns this may be too short a time as studies into task time show variations in time spent depending on the complexity of the tasks (Borlund et al. 2012) but the researcher was concerned about cognitive overload and trying to keep the total study time to a reasonable time for participants. In similar studies Marlow et al. (2008) gave participants five minutes, Chu et al. (2012) did not present the time allocated but participants searching in English did not exceed ten minutes on average or the studies did not report

1. *Your friend from Peru and their family (2 members) are coming to visit you for 6 months while you are in the UK. Develop a list of instructions to help them apply for the necessary visas.*

2. *A family member is coming to the UK to live and wants information on housing. They have heard there are a number of options and have asked you for advice. Identify the options available to them and recommend which they should choose. Give reasons to support your recommendation.*

3. *Your friend just got back from a trip abroad and suddenly developed a high fever. A dry cough, chills, and breathing difficulties soon followed. What could they have? They have no insurance and have asked your advice on what to do. Provide them with recommended actions.*

4. *Your elderly neighbours have heard about the UK government's 'digital by default' initiative and are concerned about whether this will affect them and their friends at the local community centre. They have asked you to find out more about it. Use your best judgement to highlight what would impact them with reasons for your choices.*

Figure 5.1: Search Task Descriptions

on this (Kralisch & Berendt 2004, Berendt & Kralisch 2009). In retrospect, although some participants required the full time for some tasks, the average across both participant groups was less than the ten minutes allocated and so has given some justification to the decision. There were also up to five minutes for the participants to read the task and complete the pre- and post-questionnaires. This allowed for no more than one hour in total. Post-study discussions then ensued with time-scales dictated by the discourse, ranging from 25 to 55 minutes. Tasks were distributed to participants using a Latin square design to account for task fatigue and potential learning effects (Kelly et al. 2015). The participants were asked to read the description of each task and search for relevant documents/sources, bookmarking any website deemed of most relevance to resolve the task. Due to the reliance on screen recording software to record user interactions, and a limitation on available software licences, the study location was dictated by the location of the hardware that had the software installed. Morae Recorder was used to capture each participant's search session including audio and video. Post discussion data for the first three sessions were also recorded using Morae Recorder, while the remainder were recorded on a Dictaphone, with transcriptions written up in notepad and imported into NVivo for analysis. Using the Chrome browser, each participant was asked to use the Google Search

Engine to start each task but were not limited to the search results page. Google Search was chosen (Gross 2014, Kelly et al. 2015) to maintain a standard approach for all participants, and was a justified choice as it was the only search engine selected as being used by all participants, as identified in pre-study, with the next best being Bing (2 participants) and four other instances of an alternative search engine. At the end of each task the participant was also required to complete a post-task questionnaire (on a 5-point Likert scale), which was displayed on screen as shown in Figure 5.2, examples of which can be seen in Table 3.5.
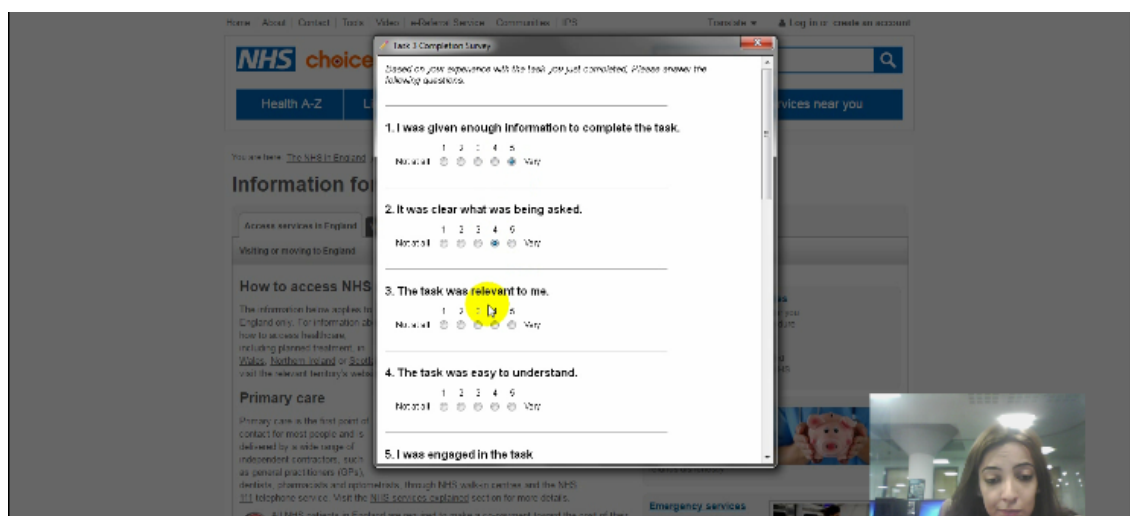

Figure 5.2: Post task questionnaire screenshot.

5.3.1 Analysis

Quantitative data is analysed using descriptive statistics in the form of the mean for normally distributed data and median for the data non-normally distributed. To determine statistical significance the non-parametric Wilcoxon signed rank test is utilised for non-normally distributed data and t tests for normally distributed data. For results derived from the post discussion, thematic analysis is used to help explore participant experience and their search patterns allowing for theme development and to identify suitable recommendations to address research question three.

5.3.2 Metrics

To determine the relevance assessments of the bookmarks logged by the participants, all bookmarks were assessed by two native English-speaking Information Retrieval researchers (Józsa et al. 2012) using a voting strategy and given scores between 1 and 4, where 1 is not relevant, 2 is tangentially relevant, 3 is partially relevant and 4 is totally relevant. In instances where any documents were not assigned the same score by the two assessors in the first round discussion was sought. Those that were partial matches, that is, were scored a 1 and 2 or 3 and 4, were discussed but accepted as from a binary perspective partial and total relevance were deemed relevant with the inverse for tangential or not relevant (White 2016, pp.151). In those cases where no match was evident, further discussion was had and a single score was agreed, although this only occurred for a very small number of cases. In no instance was a stalemate found where one or both reviewers could not agree a decision. Details of all judgements (for both this study and the findings from chapter 6 are detailed in Table 5.1.

Topic	Total Match	Partial Match	No Match	Total
1	43	28	3	77
2	92	46	7	145
3	93	27	4	124
4	81	16	5	101

Table 5.1: Relevance judgement inter-reviewer agreements by task

To assess the classification of queries and reformulations, definitions after Chu et al. (2012) were used and determined by the same researchers.

Using Morae Manager (see Figure 5.3) each recorded session was manually tagged in order to establish several measures and metrics.
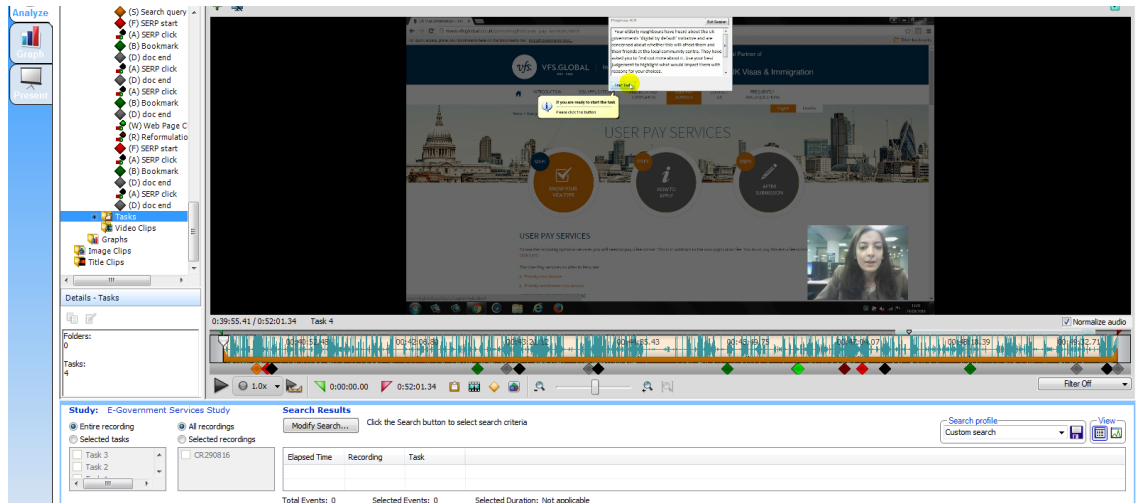
Figure 5.3: Image of Morae Manager for the recording of metrics.

Total task time was systematically logged when users clicked start task and end task; number of queries was the total number of times queries were submitted by participants or they clicked on a Google-related search link; length of query is the total number of terms per query; number of assisted terms are the number of query terms entered through the assistance functionality; length of time querying is the time from when they click on the search field up to the time they submit the query; time on the Search Engine Results Page (SERP) is calculated from when the SERP page is loaded to when the participant navigates away, either by SERP click or switching tab; link position is dependent on the listing number of the SERP link clicked assuming there are 10 links per SERP page; times bookmarked are the total number of documents bookmarked during that click-through session; The number of times in-site search and in-site link click are the total number per click-through session and the observational notes were key observations about participant search behaviour and are used to back up the quantitative nature of the log data.

5.4   Study Analysis

This section will detail the study conducted as part of the mixed methods phase, findings of which were published in (Brazier & Harvey 2017*a,b*).

5.4.1 Experimental Conditions

At the time of the study taking place, hardware with Morae Recorder installed was limited to four laptops. This limited the maximum number of four participants per session. As a result a total of three sessions with two sessions of three students and one of four took place as dictated by participant and technical equipment availability. Despite the mobile nature of laptops, the experiments took place in a lab environment.

5.4.2 Recruitment and Sampling

Participants for the study were sought via university mailing lists, paper adverts and face to face enquiry by the researcher, with the stipulation that contribution was voluntary. Face to face enquiry was the most successful with 7 participants recruited by this method. 10 study participants were recruited in total, whom were all international PhD students from Northumbria university and spoke English as a second language. Although a larger number has been recommended, this study was designed to sensitise the researcher to the experimental method, as such it was felt a lower number of participants would be sufficient for this purpose. All participants were from different countries across Europe (2), Asia (7) and Africa (1) with a total of 11 languages spoken natively, and 15 languages in total up to a competent level. 4 participants were female with an average age of 31 (*SD = 3.56*) and 6 were male with an average age of 31.5 (*SD = 3.33*). Each was remunerated for their participation with a £10 Amazon voucher. The level of English proficiency was self-assessed (Marlow et al. 2008) with 8 of the participants declaring themselves fluent and 2 competent with all participants using IT daily and formulating queries (on search engines) in English daily (9) or a few times a week (1). Half of the participants had used UK government e-services previously, 3 hadn't and 2 were unsure what was meant by the term. When judging their own abilities in formulating queries in English, identifying relevant search results and information on websites (all important skills for these tasks) five participants said they were "very confident" with the remaining five stating that they were less confident. Participants A and F were particularly lacking in confidence when it came to these abilities. It is worth noting that despite Participant F's low confidence, their self-assessed proficiency in the English Language was fluent. Let us refer to the

most confident group as "*confident*" and the other group as "*unconfident*" throughout the section.

5.4.3 Task Relevance

All four tasks were assessed by the participants as being relevant or partially relevant to them with task one receiving the highest average relevance score and task four the lowest, as detailed in Table 5.2. Inter-participant agreements of relevance were considered as part of this research but would be worthwhile to investigate in future.

Topic	The task was relevant to me	I am interested in this topic
1	4.5	4
2	3.5	4
3	4.0	2
4	3.0	4

Table 5.2: Non-Native English Speakers Task Relevance and Interest

5.4.4 Bookmarks

In total participants created 267 bookmarks, with an approximately equal split between governmental and non- governmental resources. Table 5.3 shows the total number of bookmarked URLs that participants deemed relevant to the tasks and whether they were from governmental sources and the mean relevance score. Of all the URLs bookmarked only 60.7% were either partially or totally relevant, with 30.7% tangentially relevant and 8.5% non-relevant and there were no significant differences between the median number of bookmarks per task with each task receiving 8 or 9 per participant on average. Surprisingly, there was little difference in terms of relevance between governmental and non-governmental resources. This was mostly due to some participants bookmarking internal policy documents or documents discussing best practices for civil servant software engineers which were deemed to be only tangentially relevant and unlikely to be of help in the given contexts.

Bookmark	No.	Relevance
Governmental:	141	2.91
non-Governmental:	129	2.92

Table 5.3: Bookmark types

5.4.5 Reading times

There was a considerable difference in reading times between participants, as shown in Table 5.4, which may be partially explained by the search strategies employed. Participant C in particular had a unique strategy for searching: in two tasks (2 and 4) they entered a URL directly (gov.uk in both instances), bypassing the search engine and using the in-site search functions and click-through to navigate the sites across only one tab. While in the other tasks (1 and 3) they only entered 1 query and again navigated through the use of in-site search and in-site click-through. This has direct influence on the amount of time spent on the SERP as well as the total time on documents, as seen in Table 5.4.

UserID	Average Precision	Time On Documents
A	0.74	48.19
B	0.69	42.26
C	0.50	291.00
D	0.50	29.27
E	0.57	18.11
F	0.41	24.12
G	0.83	75.32
H	0.92	85.83
I	0.65	62.32
J	0.49	35.13

Table 5.4: Time on documents in seconds vs. average precision of tasks.

One might expect the amount of time needed to read documents to be inversely correlated with the reader's proficiency in finding relevant information in texts. Comparing the time spent reading documents by participants in the *confident* group with those in the *unconfident* one, we find that the former spent significantly less time (Wilcoxon signed rank test; *p = 0.005*; diff. between medians = 24.5s). It is interesting that, once participant C is removed as an outlier, the time spent reading documents significantly predicts performance when modelled using linear regression (*p = 0.001*, R-squared = 0.754) - for each additional second spent reading documents, the expected performance (in terms of

precision) increases by 0.012. This suggests that when participants actually spent more time assessing the documents they were reading, they were able to more reliably assess relevance. The strategy employed by participant F, who noted post study that they spent little time reading the documents in an attempt to try and get as many bookmarks, does little for success in the task. The findings of this superficial/cursory strategy would appear to support Józsa et al. (2012) but is contradicted by the findings of Rózsa et al. (2015) where users recommended skimming documents and employing the strategy of using the 'find' shortcut (ctr + F) to quickly find keywords on documents. From this perspective this study again supports Józsa et al. (2012) as there was a distinct lack of use of the 'find' shortcut with only participant E utilising this function.

5.4.6 Query Classification

Queries were classified based on the definitions of Chu et al. (2012) compared against the previously submitted query, see Table 5.5.

Classification	Definition
New	New query with no terms in common with previous
Generalisation	Same query but at least one term less
Specialisation	Same query but at least one term more
Reformulation	At least one term in common, at least one term changed. Changed terms are not synonyms
Synonym	At least one term in common, at least one term changed. Changed terms are synonyms
Content Change	Change of medium e.g. to video or image
Spelling Correction	Correction of misspelling
Regional English Variation	Changing from British to American English

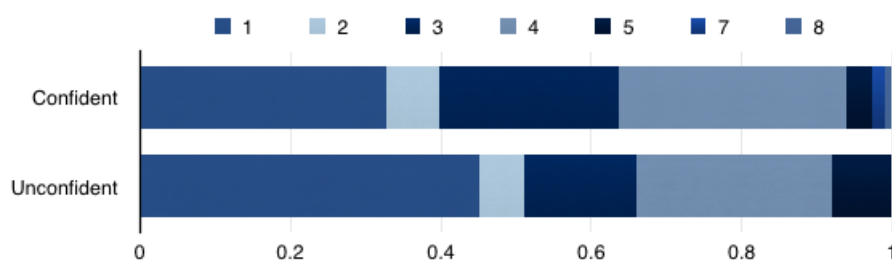Table 5.5: Query Definitions

Figure 5.4: Query classes by group.

Although not significant, there were differences in the distribution of queries submitted by those in the *confident* and *unconfident* groups over the query classes (as shown in Figure Figure 5.4). *Confident* searchers used more "reformulations" (30%), "specialisations" (24%), "generalisations" (7%) and "spelling corrections" (2%). Whereas the *unconfident* searchers resorted to more frequently starting a "new query" (45%) and used more "synonyms" (8%). In contrast to the findings of Chu et al. (2012), the distribution of classifications reveal that "new queries" and "reformulations" accounted for the majority of queries, approximately 66%.

5.4.7 Performance

As shown in Table 5.6, there was considerable variation in performance by different users with the bookmarks of 5 participants being only relevant in 50% or less of cases. There was also variation in the numbers of pages bookmarked; one participant only bookmarked 3 per task on average with the majority bookmarking 5 or more. Participant F acknowledged their limited bookmarks for the 3rd task as in a real scenario they would not risk the health of another by self diagnosing, and would instead only refer that person to a health professional in the first instance.

User	Precision	Bookmarks/task
A	0.81	6
B	0.74	11
C	0.50	7
D	0.43	10
E	0.44	9
F	0.43	9
G	1.00	6
H	1.00	3
I	0.80	5
J	0.49	9

Table 5.6: User performance.

When viewing performance by task, the performance of participants was higher during task 1 as was the number of in-site links they clicked (Table 5.7). In post discussion it was noted that for those participants who found the visa section of the gov.uk website, which utilises a wizard to guide users, the process was simplified and informative and was the cause for the increased number of in-site clicks and performance. They also noted this

facility had language selection, although no participant used an alternative language to English. This is found to confirm the notion that lower cognitive effort of the search option (in this case the wizard) can directly affect the preference of said search option (Berendt & Kralisch 2009). It also highlights the point made regarding the language of the in-site links' diminishing the multilinguality of the web. In this case when users were provided the option of other languages, they still preferred links in English.

Task	Average Precision	In-site link clicks
1	0.91	2.37
2	0.70	0.46
3	0.54	0.24
4	0.38	0.37

Table 5.7: Table of performance by task and use of in-site link clicks.

When comparing the performance of the participants against the perceived task difficulty (pre-task question 4) they were unable to successfully predict how well they would perform (Figure 5.5 and Table 5.8), in fact it appears that they performed best in cases where they expected to perform poorly! With little correlation between their post-task assessment of difficulty and their pre-task prediction of the same (0.26, p-value = 0.11) it would suggest that they were unlikely to dramatically change their perception of a task's difficulty even after having actually performed that task.
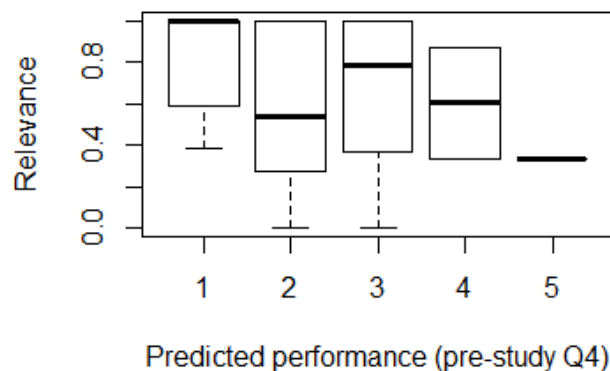

Figure 5.5: Performance by expected task difficulty.

5.4.8 Confidence and Perceived Performance

Confidence in their own abilities was in evidence throughout the study and, even in the case of the few who doubted their abilities in the pre-study questionnaire, the level of con-

Pre-study Q4	Relevance	Count
1	1.00	7
2	0.53	18
3	0.79	12
4	0.60	2
5	0.33	1

Table 5.8: User performance vs expected task difficulty.

fidence was predominately in the confident to very confident response levels. As shown in Figure 5.6 and Table 5.9, responses to the post-task questions on self-perceived performance (Q6), confidence in having completed the task well (Q8) and of having identified relevant websites (Q10) were overwhelmingly positive. This was also the case with regards to understanding what they had read during the task (Q11) and on the websites bookmarked (Q12). This is further reflected in their categorisation of task difficulty (Q7), where the median response was 2 (not difficult). This confidence is in stark contrast to their overall performance, which was generally quite poor.
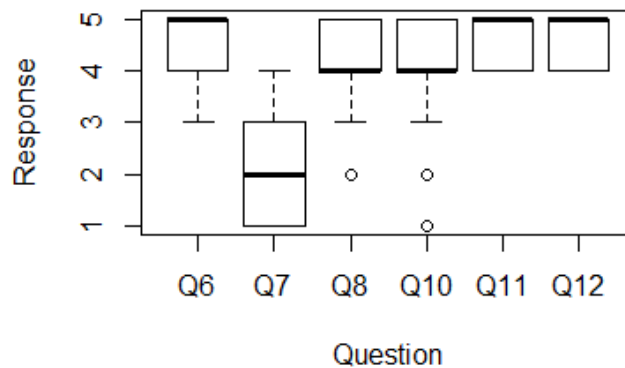
Figure 5.6: Confidence in abilities and task difficulty.

Response	Q6	Q7	Q8	Q10	Q11	Q12
1	0	14	0	1	0	0
2	0	10	3	1	0	0
3	4	9	3	1	0	0
4	7	7	18	21	17	16
5	29	0	16	16	23	24

Table 5.9: Confidence in abilities and task difficulty.

Further to their views of their abilities, the post-task review of their perceived performance in comparison to their actual performance shows participants were not able to correctly determine how well they had performed. The majority of responses were in

the confident to very confident range while precision was actually lower than for the less confident ratings ($p < 0.76$) as shown in Table 5.10.

Response	Performance		Count	
	Q8	*Q10*	*Q8*	*Q10*
1	0	1.0	0	1
2	1.0	0.22	3	1
3	1.0	1.0	3	1
4	0.61	0.63	18	21
5	0.69	0.69	16	16

Table 5.10: Confidence in content that satisfied the task (Q8) and confidence in relevant websites from search results (Q10) versus performance.

5.4.9   Confidence and Querying

It has already been noted that there is a difference in the reading time of documents amongst the participants - when grouped by confidence the *unconfident* spent significantly more time reading documents than the *confident*. This group also submitted significantly fewer queries ($p = 0.033$; diff. between medians = 2) which appears to contradict the study by Bogers et al. (2016) which found non-native speakers to query much more. The lack of confidence also appears to effect query formulation time as well as the time spent reviewing SERPs with the *unconfident* taking significantly longer to submit a query ($p = 0.0025$; diff. = 4.5s) and spending significantly longer on SERPs (p *ll* 0.01; diff. = 9.5s), supporting the findings of Chu et al. (2012).

Surprisingly the *unconfident* were found to use assistive functionality no more than the *confident*, but this was not significant. Although assistive functionality is discussed (Rózsa et al. 2015) and the participants recommended using Google suggestions to mitigate spelling mistakes, there is little in the literature on actual usage or lack thereof, and whether this is common among ESL communities. In this study there were only nine instances of submitted terms with spelling mistakes by six users across tasks two, three and four. Such a small number was also noted by Chu et al. (2012) and may be explained by the fact that the *unconfident* submitted shorter queries, a behaviour also noted in other studies (Rózsa et al. 2015, Bogers et al. 2016).

The *confident* group had more failed queries (i.e. those with 0 clicks), perhaps suggesting they have the confidence to reject a query by assessing that results are poor. On

a per-topic basis the *confident* users submitted an average of 1.6 failed queries, while the *unconfident* group only submitted 0.8. The *confident* group also tended to look deeper into the results lists than the other group - on average the two groups stopped clicking at rank positions 8 and 5 respectively.

5.4.10 Behaviours

Despite some participants knowing of their existence and acknowledging their usefulness, there were no instances of operator use in this study, although one participant did state that he "probably should use them more". Whether this is an effect of confidence is debatable, however it is interesting to note that Rózsa et al. (2015) also found that participants encouraged the use of operators whilst not necessarily utilising the function themselves.

Most participants used multiple tabs. The extent ranged from intermittent (participants A, B, D, G, H, I) to extreme (participants E, F, J) with those at the lower end of the scale focussing mostly on just one tab with only occasional instances of switching between multiple tabs and the SERP. Those at the extreme end would alternate in short bursts between open documents on separate tabs (up to ten in one instance), SERPs and new search screens.

Four participants (A, B, C, J) used in-site search on websites with a total of six instances, two instances each for task 2, 3 and 4. They choose not to use in-site searches often because the general consensus was that Google was a reliable search facility and they could not say the same about individual websites. Participants E and G stated that they got better results from Google than any in-site search (in the past) and that it was just as quick to go back to the search and start again than use the website's in-built functionality.

5.5 Summary

This study expanded on previous work in multilingual IR from an information seeking behaviour perspective by examining the ways in which ESL users approach a number of important search tasks and the problems they face in doing so. In similar situations it

appears people may be overestimating their abilities and assessing non-relevant sources as being relevant and helpful. The participants found the tasks to be relevant, assessed their English-language searching and reading abilities to be good and, having completed each task, were confident in their search and bookmarking performance. In spite of this, almost half of the documents they selected were assessed by native speakers to be either non-relevant or only tangentially relevant. It was identified that even among ESL participants, who had good overall proficiency in English, there were subgroups of participants who were confident and those who were less so, or unconfident in their abilities to formulate queries in English, identify relevant search results and information on websites. It was found that these levels of confidence had a number of key effects on the participants' behaviour when completing the tasks. The unconfident group spent more time assessing documents, more time formulating queries (yet submitted shorter queries) and queried less often. In spite of this, they had far fewer failed queries and actually performed better (in terms of precision). The study also identified differences in the kinds of queries submitted between the groups, with the confident users more likely to reformulate their queries than submit new ones.

The results point to many participants being overly-confident of their abilities and that this over-confidence may have resulted in them taking riskier strategies, being less thorough in their evaluations and, therefore, bookmarking a larger proportion of non-relevant documents. This echoes results from the literature on superficial searching strategies (Józsa et al. 2012) and shows why such strategies might arise. Results suggest that success in this context may be less dependent on second language proficiency, as one might expect, and may instead hinge on the search strategies employed and the fastidiousness of the user in assessing document relevance, elements which could be taught or where assistance could be given (Harvey et al. 2015).

The following chapter will build on these findings by expanding the participant numbers and compare performance of both non-native and native English language users when performing the same search tasks in near identical conditions.

Chapter 6

Findings: Experiment

6.1   Introduction

This section will outline the analysis of the second phase experiment two study comparing the information interactions of both native and non-native English language users and has been published in Brazier & Harvey (2018).

6.2   Experiment Analysis

The chapter will discuss sampling of the study participants, their perceptions of the tasks, performance and behaviours before concluding.

6.2.1   Sampling

Initially there were thirty participants recruited as detailed in subsection 3.6.13, however, one native user was removed as they failed to bookmark any documents, opting instead to write notes (not URLs) about their interactions. During initial data analysis, it was identified that two of the native participants, who had acknowledged they were (non UK) native English speakers, actually registered on their pre-study demographic questionnaire as only being fluent in English and spoke Hindi and Hausa natively. As a result, these participants have been grouped with the non-natives, resulting in 12 native and 17 non-native participants (N=29), all of whom were postgraduate students conducting a PhD project at Northumbria university. Non-natives were from countries across Africa (3),

Asia (10) and Europe (4) with a total of 18 languages spoken natively, and 27 languages in total up to a competent level. 14 self-assessed as being fluent in the English language, with 3 competent. 7 of the non-native participants were female with an average age of 28 ($SD = 4.619$) and 10 were male with an average age of 31.5 ($SD = 3.440$). All use IT daily, with 16 using a search engine in English daily, and 1 every few days. 10 English-natives were British born, with 1 African and 1 Caribbean. 5 of the native participants were female with an average age of 37.4 ($SD = 10.229$) and 7 were male with an average age of 27 ($SD = 2.268$). All use IT daily, with 11 using a search engine daily, and 1 every few days. 15 non-native and all native participants were confident or very confident in formulating queries, identifying relevant search results and information on website in English. The majority of both groups had used UK government e-services previously (10 non-native and 9 Native), 3 (non-native) and 2 (native) hadn't, and 4 (non-native) and 1 (native) weren't sure.

6.2.2   Relevance Judgement

Although detailed in the previous chapter, for the purposes of clarity, Table 6.1 is presented again to show the inter-assessor judgements. This section will go further and

Topic	Total Match	Partial Match	No Match	Total
1	43	28	3	77
2	92	46	7	145
3	93	27	4	124
4	81	16	5	101

Table 6.1: Relevance judgement inter-reviewer agreements by task

provide a clear definition of the relevance score as shown in Table 6.2 along with examples of each assessment per topic. For topic 1 see Figure 6.1, Figure 6.2, Figure 6.3 and
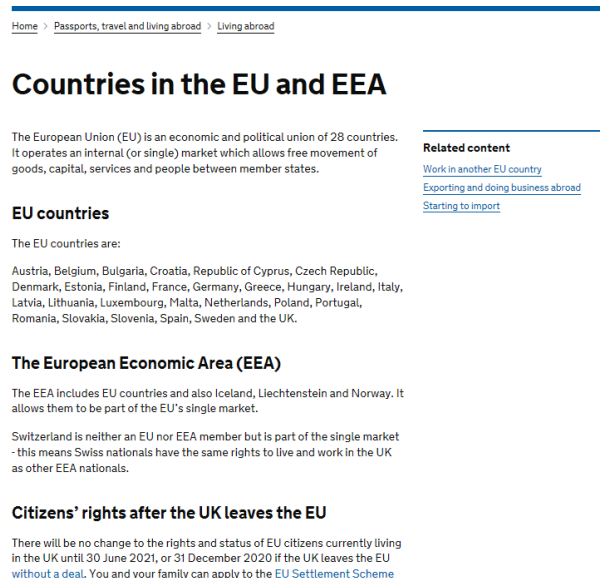
Judgement	Score	Definition
Not relevant	1	The document has no discernible links to the topic
Tangentially	2	The document is different from or not directly related to the topic but has some link
Partially	3	The document is related to the topic but has some deviation
Totally relevant	4	The document is completely related to the topic

Table 6.2: Relevance judgement definitions

Figure 6.4. For topic 2 see Figure 6.5, Figure 6.6, Figure 6.7 and Figure 6.8. For topic 3

see Figure 6.9, Figure 6.10, Figure 6.11 and Figure 6.12. For topic 4 see Figure 6.13, Figure 6.14, Figure 6.15 and Figure 6.16

Topic 1 relevance assessment examples

Figure 6.1: Topic 1 document of no relevance.

Figure 6.2: Topic 1 document of tangential relevance.

Figure 6.3: Topic 1 document of partial relevance.
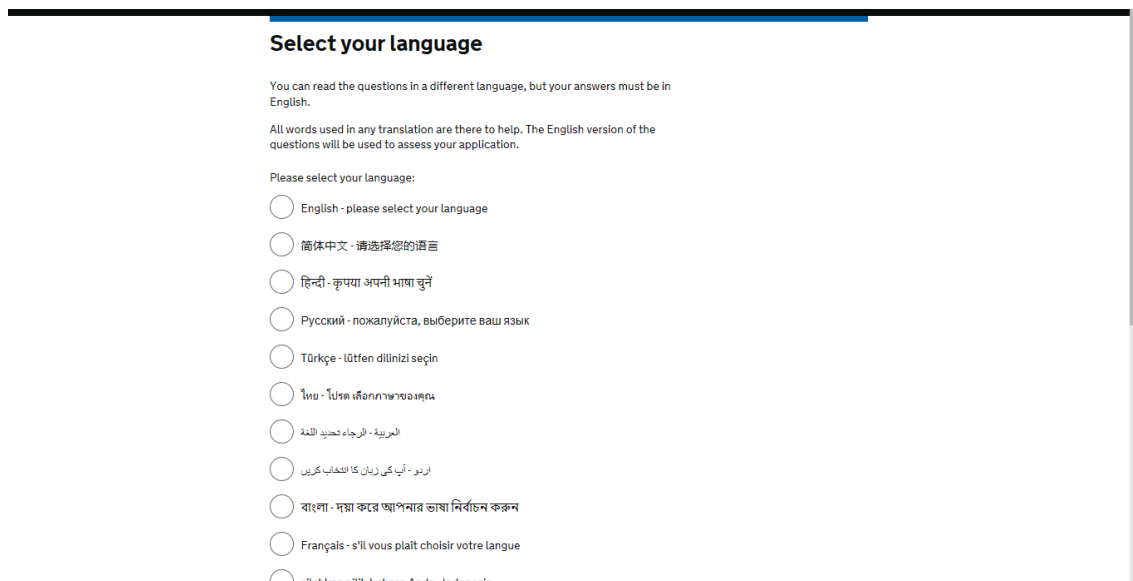
Figure 6.4: Topic 1 document of total relevance.

Topic 2 relevance assessment examples

Figure 6.5: Topic 2 document of no relevance.

Figure 6.6: Topic 2 document of tangential relevance.
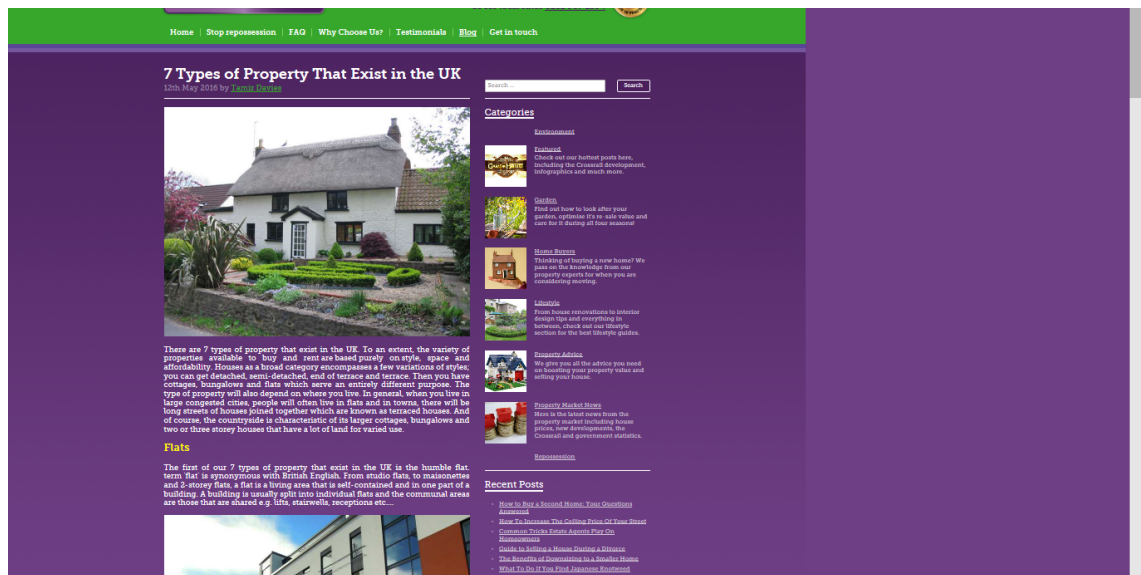
Figure 6.7: Topic 2 document of partial relevance.

Figure 6.8: Topic 2 document of total relevance.

Topic 3 relevance assessment examples

Figure 6.9: Topic 3 document of no relevance.

Figure 6.10: Topic 3 document of tangential relevance.
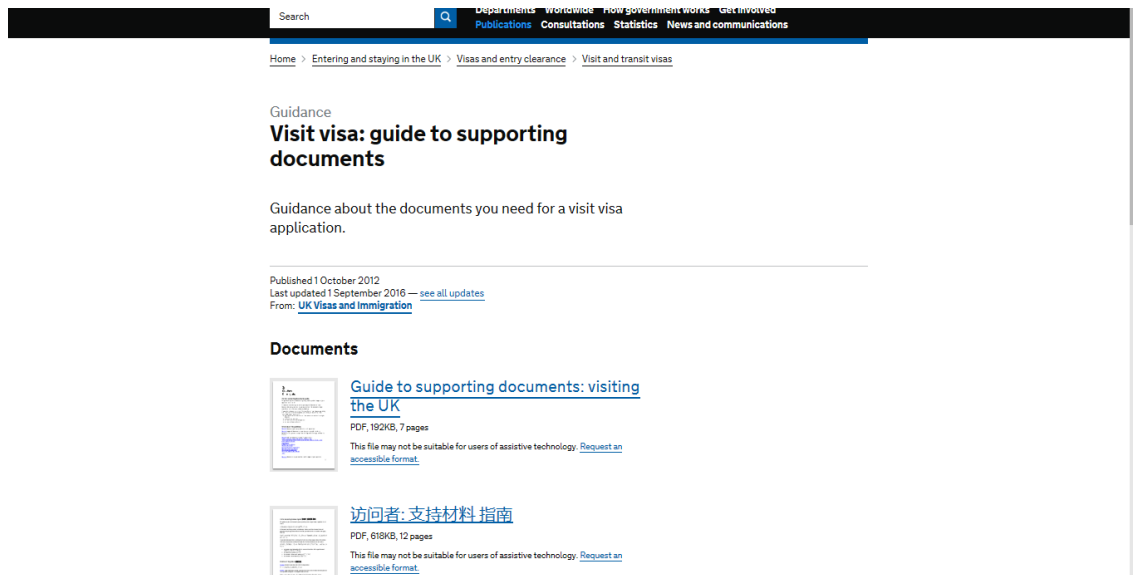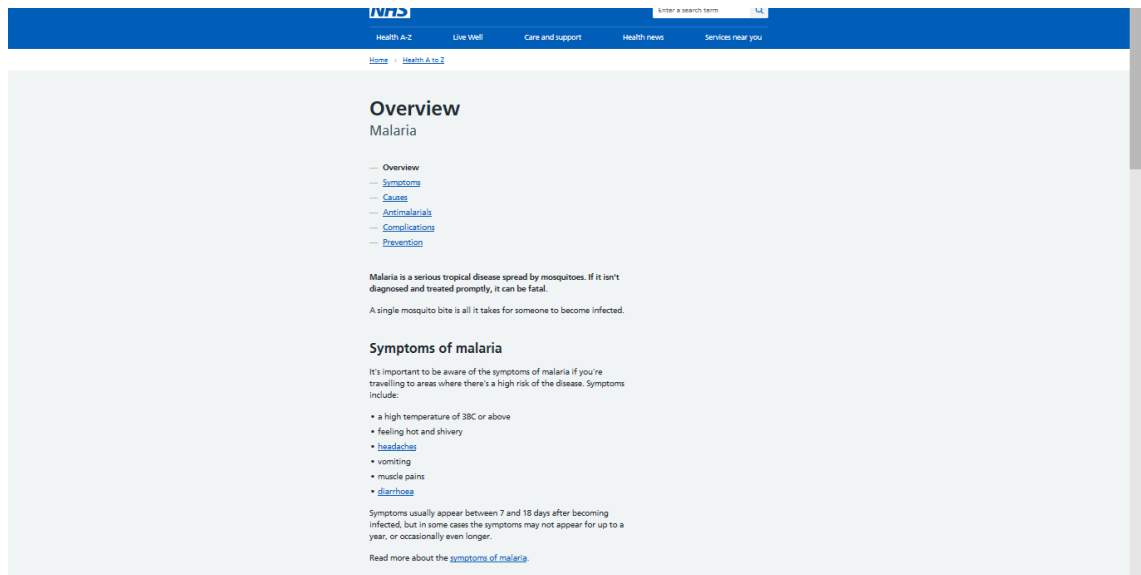
Figure 6.11: Topic 3 document of partial relevance.
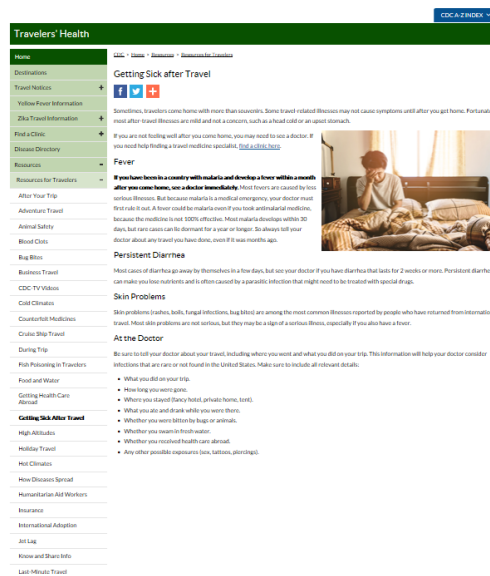
Figure 6.12: Topic 3 document of total relevance.

Topic 4 relevance assessment examples
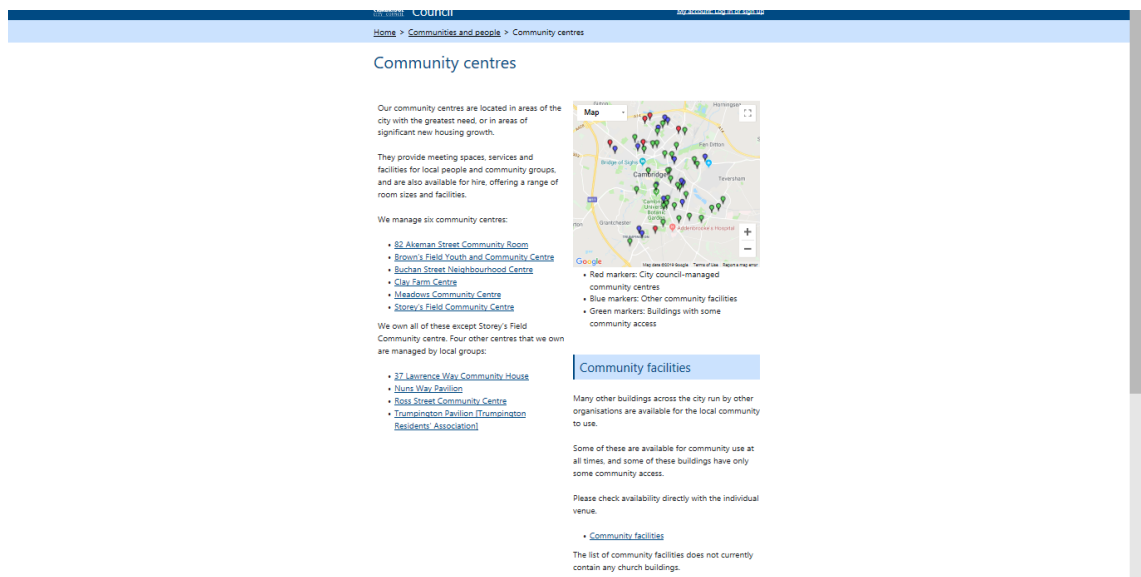
Figure 6.13: Topic 4 document of no relevance.
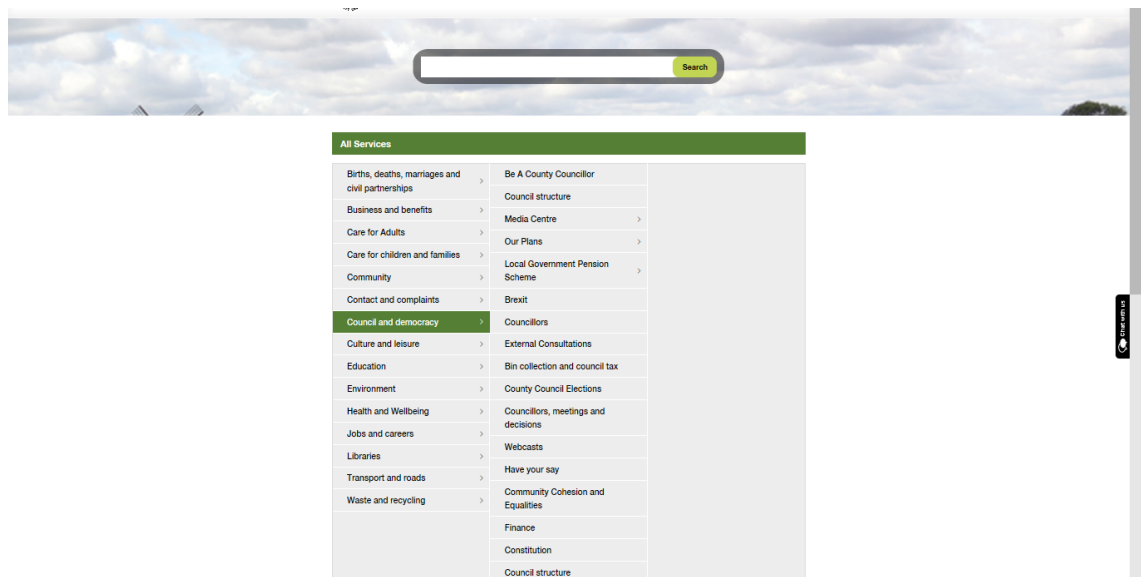
Figure 6.14: Topic 4 document of tangential relevance.
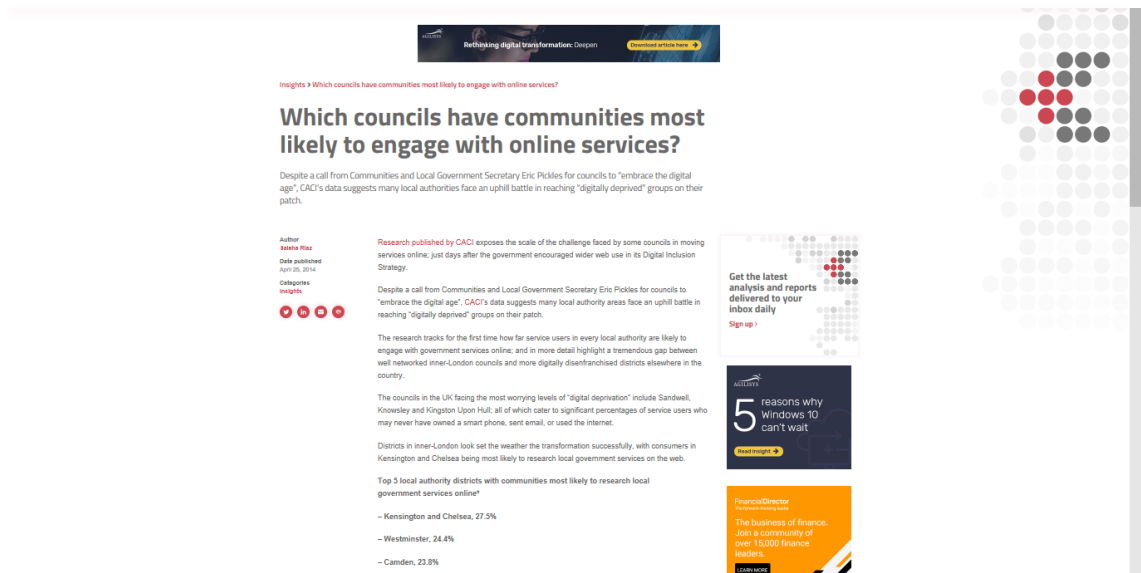
Figure 6.15: Topic 4 document of partial relevance.

Figure 6.16: Topic 4 document of total relevance.

6.2.3 Task Relevance

Differences in task relevance were statistically significant (W = 2059.5, p-value = 0.015), with relevance highest among the non-natives (see Table 6.3), while natives generally found the tasks less relevant. It is unsurprising that relevance of the tasks for natives are lower than those of non-natives considering the method in which the tasks were formu-

lated. However, it is interesting to note that, despite there being no native English speaker participation in the topic selection, no one topic was deemed completely irrelevant, with the *housing* task of most and the *digital by default* task of least relevance to both groups. When discussed post-task, the task descriptions were determined believable and realistic, although somewhat vague and general at times, as with the *health* task.

Topic	Non-Native		Native	
	Mean	Median	Mean	Median
1	3.529	4	2.583	2
2	3.588	4	3.000	3
3	3.294	3	2.667	3
4	2.471	3	2.083	2

Table 6.3: Task Relevance for both groups

	Non-Native	Native
Relevant	195	111
Partially	91	63
Tangentially	159	72
Non-relevant	14	3

Table 6.4: Native and Non-native Bookmark Relevance

The native participants spent more time on task overall (541.25 to 551.09 seconds), although not significantly so (W = 1335.5, p-value = 0.1359). This is contrary to research by Chu et al. (2012), who found the opposite to be true, with quite disproportionate average time differences between natives and non-natives.

6.2.4 Performance

The native group bookmarked fewer documents per task on average (5.213, compared to 6.647) but performed marginally better, in terms of average precision, than the non-natives overall - 0.69 compared to 0.623 (see Table 6.4) - although not significantly so (W = 1487.5, p-value=0.525).

When broken down by task (see Table 6.5) both groups performed better in task 1 with the non-natives, surprisingly, performing best, which could be explained through the design of the visa section of the gov.uk website. For users able to find this site, there is a wizard which guides them through the process systematically, thereby ensuring relevant documents are accessed on each click. In other tasks there was no such functionality

	Non-native			Native		
Task	Count	Avg. Prec	Gov	Count	Avg. Prec	Gov
1	11	0.885	0.756	9	0.863	0.740
2	8	0.649	0.288	3	0.821	0.268
3	3	0.586	0.606	3	0.576	0.525
4	4	0.339	0.542	3	0.508	0.459

Table 6.5: Performance by Task

present, either in governmental or non-governmental documents. It must be noted that estate and letting agents' websites (accessed as part of Task 2 on housing) do contain filtering functionality, which may explain marked differences in both performance and number of bookmarked documents in this task. Despite both groups relying on similar proportion of non-governmental documents, and although the non-natives bookmarked a larger number of documents, their performance is lower. Performance for task 4 is interesting, in that both groups have similar bookmarked documents and both rely almost equally on governmental and non-governmental sources, and yet perform worst here, the non-natives markedly so. Reasons for such poor performance have been touched on in subsection 6.2.3, with users struggling to balance contextual relevance with (governmental) document trustworthiness and, therefore, reliability. It is curious that despite acknowledging the lack of contextual relevance in some policy documents, there was still a large proportion of users who bookmarked said documents. As shown in Figures 6.17 and 6.18, in terms of post-task perception, users felt that they had enough information were engaged, that tasks were clear and weren't difficult, and that they were confident in the content they identified and that the tasks were complete (refer to Table 5.2 in section 4.1 for question descriptions). In 3 of the 4 tasks for non-natives and 2 of the 4 tasks for natives, between 35% and 66% of documents bookmarked were not relevant. The mostly positive nature of their post-task review is in stark contrast to their actual performance, which was identified before for non-native users in Table 5.4.7.

6.2.5 Query Submission

Natives submitted more queries yet spent less time querying (4 queries per task taking 8 seconds per query, compared to 3 queries with 9 seconds per query for non-natives), appearing to contradict the study by Bogers et al. (2016), which found non-natives to query
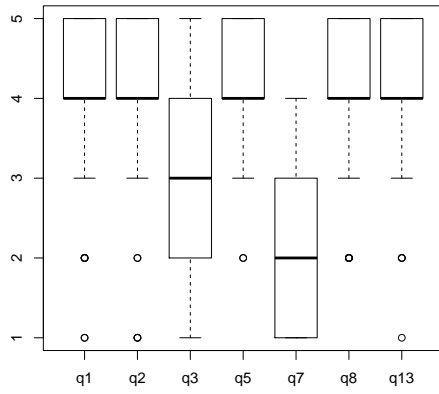
Figure 6.17: Non-native Task 4 post-response on a five-point Likert scale.
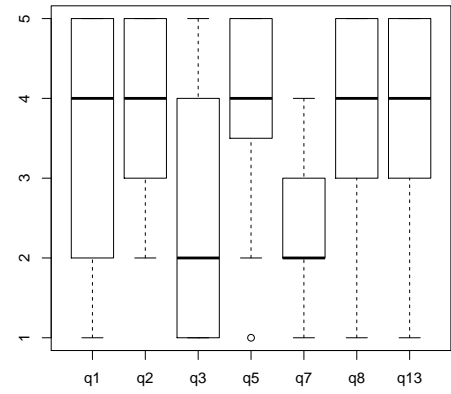
Figure 6.18: Native Task 4 post-response on a five-point Likert scale.

much more. Both the Bogers et al. study and this one found query length to be equal. Use of query assistance was significantly different between the groups (W = 109390, p-value $\ll$ 0.01): 6% of all non-native query terms were provided by or amended through Google's assistive functionality, but only 5% of the natives' terms. Some users were particularly heavy users of this feature, as there was a range between users of 0 to 75 terms for non-natives and 0 to 40 terms for the natives. There were very few instances of misspelling from both groups, which may be accounted for by the education and language fluency levels of the participants (Bogers et al. 2016), although non-natives did make the majority of errors (16 compared to 5). The experimental conditions may have influenced participant behaviour as one native user (A1) acknowledged that they were aware of the recording of the study and made a conscious effort to spell correctly, whereas in a more relaxed setting they would often rely on assistance. This was echoed by native participant B1, who explained that assistance would be used (in other settings) to complete queries to save time. A comparison of queries, classified based on the definitions of Chu et al. (2012), found that there were no differences in the distribution of queries submitted across both groups, with new queries and reformulations (66.43% for non-natives and 68.91%) making up the majority of submitted queries, despite being contrary to the initial study (Chu et al. 2012), this has been identified previously in subsection 5.4.6.
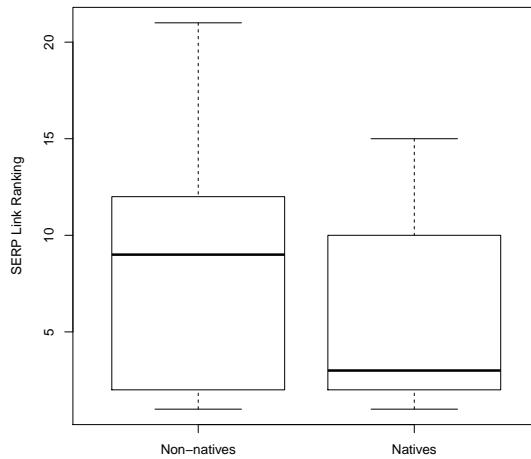
Figure 6.19: SERP Depth.
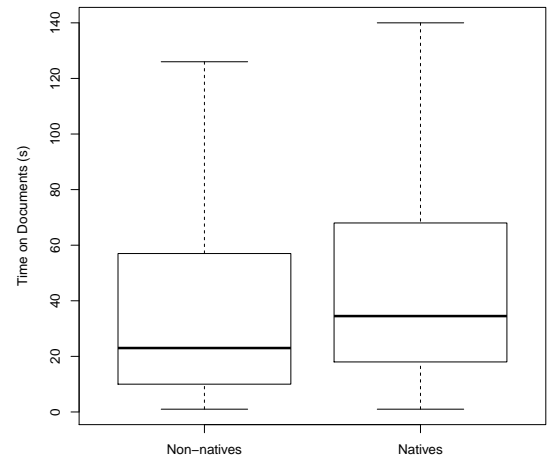
Figure 6.20: Time Spent Reading Documents.

6.2.6 Search Results and Reading

Non-natives looked significantly deeper (W = 117350, p-value $\ll 0.01$) into search results than natives with an average depth of 9 (see Figure 6.19), while the natives averaged a depth of 3. As such it is of little surprise that non-natives spent more time on the SERP (31.11 secs) than natives (29.10 secs). When discussing governmental links on the SERP, it was noted by several participants that they had to actively search for governmental links (specifically gov.uk links), as they often did not occupy the top positions of the SERP. This may explain why the non-natives both search deeper and longer than the native users, who bookmarked fewer governmental documents (Table 3.6). It is worth noting that although not statistically significant, approximately a quarter of all queries submitted resulted in zero SERP link clicks, also known as a failed query, for both the native and non-native groups. This is a reasonable indicator that they are equally proficient in identifying when a query or SERP link did not meet their information need. Although this could be explained by the level of education and English language proficiency of the participants.

Natives were found to spend more time reading documents than non-natives and significantly so (W = 90662, p-value $\ll 0.01$), as shown clearly in Figure 6.20. This is somewhat surprising, as it could be assumed that those less familiar with the language are more likely to read the documents in more depth and take more time to do so (Józsa et al. 2012, Rózsa et al. 2015), however this was not the case. It may be that natives are willing to spend more time reading the documents as it is less effort for them to do

so. Once outlier C is removed due to their unique search behaviours, time spent reading documents significantly predicts performance for non-native users (adjusted R-squared: 0.6818, p-value $\ll 0.01$) and for every 1 additional second of time spent on the document, the expected performance (in terms of precision) increases by 0.004. This could not be said for the native group.

6.2.7 Behaviours

A number of users in both groups utilised the shortcut find method (ctrl+F) to look for keywords on the current page, rather than using the in-site search functionality. In post discussion reasons for such strategies were explained due to the trust and observable success from utilising web search engines, in this case Google, rather than the in-site search facilities. This is further displayed by the usage of in-site search by both groups (mean = 0.031 for natives compared to 0.110 for natives). These behaviours have been identified previously by Nielsen (2003) and the concern is that in the time since this article, the situation has not changed. This is, perhaps, in part due to the trust placed in the results presented by major search engines and the lack of trust in bespoke search or unbranded systems. The UK Government's Digital Service have plans to update and improve the in-site search function, possibly to address this (Allum 2017), however, as these behaviours appear not to be specific to any content or source, there is some way to go for users to reap the full potential of the in-site search function.

6.3 Summary

This study expanded on previous work in multilingual IR from an information seeking behaviour perspective by examining the ways in which ESL users approach a number of important search tasks in comparison to native English users. The study has identified some marked and statistically significant differences between the groups, with non-natives using more query assistance (auto-correct), delving deeper into the SERP and spending longer in doing so. Additionally, the longer they spent reading documents, the higher their performance, which was not the case for the natives, despite spending the most time read-

ing documents. Nevertheless, there are also some similarities in their information seeking behaviours as both groups submitted similar length queries and are equally proficient in identifying when a failed query did not meet their information need. This proficiency was not reflected in their performance in some tasks, with both groups unable to consistently predict when they had not performed particularly well. Relevance of the bookmarked documents, in this case, was found to be subject to the contextual and practical application of the information, and the official and trustworthy (yet not contextually-relevant) nature of governmental documents, which could go some way to explaining poorer performance among both groups. These results are somewhat alarming as it is reasonable to assume that as users' educational levels, (English) language proficiency and/or information literacy lower in comparison to those of the study participants, their own performance would in turn diminish. In light of a solely e-government system, this raises significant concerns about users and the information they rely on to make judgements that can have real world implications. One way of mitigating such concerns is to consider the use of wizards. Performance was high among both groups when this system design was implemented, and in post discussion, there was positive sentiment (from both groups) towards such a tool as they provide a clear and structured platform to information. The following chapter will detail the post discussion focus group findings, highlighting the extracted themes from the discourse of study participants.

Chapter 7

Findings: Post Study Focus Groups and Themes

7.1 Introduction

This section details the findings of the thematic analysis and will set out the themes identified following the post study focus group discussions. In total five themes emerged from the discussion points, relating to participants experiences and observations of their information interaction. Each theme will also incorporate the recommendations and comments provided by both the native and non-native English language users and concludes the first phase study. Non-native users are identified by user A, B, C etcetera, alternatively native users can be identified by the pseudonym's user A1, B1, C1 etcetera.

7.2 Process

The data collected during all the post study focus groups were transcribed verbatim by the author. The transcribed data were read and re-read, with the recordings listened to a number of times to ensure accuracy and to gain a familiarity with the data. During this phase, initial thoughts were noted down, as recommended by Riessman (1993), which were then used to form the codes (Braun & Clarke 2006). The third phase consisted of the formation of themes, identified from the generated codes. It was at this stage that the codes were reviewed by a colleague for credibility, dependability and confirmability. Follow-

ing discussion on the codes and after amendments were made, initial theme names were formulated. On review, refinement was required as themes were identified as too closely related and were amalgamated or lacked detail and were discarded. The themes were also checked to ensure a coherent pattern, and that the themes reflected the data (Braun & Clarke 2006). It was at this stage that member checking was conducted. Feedback from the two participants (one ESL and one native English) focused on the theme and sub-theme titles in line with the content and quotes. With recommendations including the changing of subtheme *Current skills and knowledge* into separate subthemes *Past experiences and search skills* and *Existing knowledge*, and subtheme *Learned Experience* into *Learning as searching* as the former implied prior experience and was a duplicate of the aforementioned *Past experiences and search skills*. Phase five involved the confirmation of theme names and their definitions. The final phase is the reporting of final results as shown in Table 7.1, which shall be discussed below along with pertinent examples to illustrate the themes.

Theme	Subtheme
Knowledge, Experience and Understanding	*Past experiences and search skills* *Existing knowledge;* *Learning as searching*
This theme incorporates aspects that make up the users search behaviours. These include their previous experiences and the skills that they have amassed, such as web browsing and effective search. This also include existing knowledge, which in this case is different from previous experience. Existing knowledge is based on the effects topical knowledge may have on a user's behaviours, whereas previous experience is the user's actual experience. For example, a user can have knowledge of the Gov.uk website and its services, but no previous experience of having used those services. This is the distinction. This theme also includes users understanding through learning as they search. This focuses on their understanding to adapt their searching behaviour based on their interactions with information they had little to no knowledge or experience with prior.	

Assistance and Accessibility	*Convenient or necessary support*
	Digital Interactivity
	Location
This theme focuses on the usability of the system design, specifically focusing on the inclusion of assistance and accessibility features. This includes discussion on whether that support is for necessity or convenience as well the participants recommendations towards online digital support services.	
Visual Design and Appeal	*Use of imagery*
	Layout and design
The theme of visual design and appeal specifically focuses on the participants comments surrounding the visual aspects of the web documents (content) and systems design and there effects on participants interactions.	
Content and Navigation	*Targeted Audience*
	Search Engine Results
	Navigation
	Trust
	User Judgement
The theme of content and navigation differ from that of the previous theme in that it focuses on depth or substance of content (not just its design) and the design of the system from a navigational perspective. It also includes the perspectives of the user in their interactions with the content and system through their judgements of trust in sources and content.	
Context	*Scenarios*
	Naturalistic information seeking
This theme is specifically focused on participant feedback on the search tasks and the experimental settings and makes up part of the recommendations for the search task development and future research settings.	

Table 7.1: Themes and Subthemes

7.3 Knowledge, Experience and understanding

The participants' knowledge, experience and understanding related to the recall and reliance on past experiences, existing search skills and knowledge, and searching as learning. The range of sub-themes within this theme demonstrate the complexity and multi-dimensional nature of experience as a phenomena.

7.3.1 Past experiences and search skills

Participants recall of past experiences helped in the execution of tasks, especially for familiar tasks. These were focused on the visa application, housing and health tasks for both sets of users, although, perhaps unsurprisingly, only a few native participants had experience with the visa application process. These experiences manifested themselves in the use of direct URL's (domain knowledge) (Weber et al. 2018) rather than using search, or using web search for specific websites, such as, NHS or Rightmove that were deemed pertinent to the task.

> "I search for UK website and then search from there." (User C)

> "Oh, I think because em, I knew which websites I was going to so I just typed in the name of the website in the search engine which might have cheated a little bit. " (User H1)

7.3.2 Existing knowledge

It stands to reason that participants interactions are shaped by their existing knowledge (Bilal 2004, Chu et al. 2012, Józsa et al. 2012, Weber et al. 2018). In this study this was no exception. Although this concept is steeped in aspects of the other sub-themes and overlap may occur, this is considered stand-alone from past experience or learned experience for the role that existing knowledge plays on the decision-making process (Park et al. 2014, Berendt & Kralisch 2009, Freund & Berzowska 2010). For example, User M identifies the role existing knowledge of current topical issues plays in their decision making, describing it as a bias.

"I was looking for European citizens access the NHS and there was no mention of Brexit anywhere. Hot topic but my first like, I realised when I was looking for this information my mindset was biased by Brexit and there was nothing about it because nothing has changed I know. I know because I am living here but from outside it's not the same perception so should be a more updated and competent to take into account all the issues that arise recently...just say nothing has changed since, is information, it's natural to think about it." (User M)

" I guess because we are quite experienced in it, using gov.uk [*sic*], so it was quite easy for us, but somebody brand new might not find it so friendly and so easy, yeah. " (User Q)

7.3.3 Learning as searching

Learned experience is a theme related to the process of learning as they complete the tasks or learning as searching. For a large proportion of non-native and native participants this amounted to learning about the topic of 'digital by default', and the visa application process for native participants. This learning allowed the participants to progress through the task (Ghosh et al. 2018), building on this fact-finding, to provide solutions.

"I could see my neighbours asking me about because I am tech savvy, that was interesting as it was the only task I knew nothing about....That was the task where the government sites did not have the information, I was relying on the news websites, the guardian and the independent to what is the task about, what is digital by default, once I knew what it was, I then went to the government website to find how it affects them." (User G)

7.4 Assistance and Accessibility

The theme of assistance and accessibility brought up several sub-themes related to the convenience of assistance (Clough & Eleta 2010) or the necessity (Marlow et al. 2008) as

well as the use of location, which fuses both. The subtheme of digital interactivity is also included as participant recommendation towards online digital support services.

7.4.1 Convenient or necessary support

The use of autofill is frequently discussed through post discussion, with participants acknowledging their reliance on such features to speed up the search process or account for their mistakes (Berendt & Kralisch 2009). Native users appeared to be much more open to acknowledging their use of these features, confirming it as a convenience.

> "Google is a powerful search engine....but you have to know which terms you're using, search terms you're using....I don't use special terms and I should use them more often" (User B)

> "Autocorrect, I make so many typos." (User F1)

> "Word correction, if I search for a word and a letter is wrong I may not get the same results as if I spelt it correctly and I may not resubmitted if I don't think I have it wrong." (User D)

There were multiple references to pre-existing use of assistive functionality within the visa application process, from both participant groups. Use of assistance has been advocated for ESL search systems (Clough & Eleta 2010), however, not at the expense of content (Marlow et al. 2008). Although not negating the need to read content, the systematic approach of the 'wizard' is noted as being highly effective for the process of identifying if a visa was required, and the steps needed to complete the application.

> "I think the website for the [visa] application process was quite clear. You have your options and it was quite clear in sending you to a path." (User L)

> "On the government websites quite often, mainly with the visa one it gave you links to the next step through like the application process to see if you need a visa, which visa you need, how much it's going to be, apply for it. I think that was pretty good." (User M1)

Participants made a number of references to the support of users through practical case examples, as a means to offer guidance and support.

> "It'd be really difficult for like government sites to employ, implement this but if they can like do some like practical suggestions for example, I mean, you can go down to this solicitor or maybe, I mean, refer to this particular people for further clarification like if it's housing you can go down to this particular place to get more information something of that, there people can get much more practical information" (User P)

> "Examples of good practice...in context, like in housing you could have links to local schemes in your area that are run, that are official and run by the council " (User E1)

> "the government website they could have people who searched on this, that would really help...during a particular period the, erm, number of searches for that term come up so to save you time browsing through other topics they can tell you people recently have been looking for them...so it kind of harmonises your understanding of what you require " (User G1)

> "Having like a section like related topics like on the visa it's got related, it's got all the links there in one place" (User L1)

Non-native participants also refer to other forms of assistance or advanced features designed to support users. However, they do suggest the teaching of these skills, but question there use after implementation (Rózsa et al. 2015), noting users lack of knowledge on how to use Boolean operators, confusion of such features and the added complications such features may bring (Eagleton & Guinee 2002).

> "High end functionality but it probably makes things more complicated - my university had this but the students didn't use it. " (User C)

> "These options will confuse them. but the knowledge might help them. even drop downs can confuse them" (User B)

7.4.2 Digital interactivity

Digital interactivity is related to participants recommendations for and opinions of, online digital support services. This was in relation to facilities that were missing and could offer solutions in light of the digitisation of existing services. Despite offering possible solutions, participants from both groups also acknowledge the disadvantages of such facilities (Clough & Eleta 2010, Marlow et al. 2008).

> "I think the suggestions for relevant search terms as well, cos especially if you're a non-UK national, erm, your vocabulary's not going to be as big. So, you might have one term in your mind but searching for another term, which would be a lot more relevant, and give them a lot more relevant information, and I don't think the gov.uk website has that." (User J1)

> "an online chat might be quite useful on the gov.uk website cos HMRC has got one" (User G1)

> "I don't know if they're going to be using an agent, you know the online agent, those annoying things that pop up, you know like a live chat. Then again for somebody for whom English isn't the language and there <laughs> unless there's some kind of audio facility." (User D1)

> "pop-up windows asking if you've found what you're looking for. Although this could be annoying." (User B)

> "have a chat, like a live chat facility" (User Q)

> "a chat function...but then which hours would you man that?...presumably you'd have helplines as well" (User F1)

7.4.3 Location

Web Search Engines can and do tailor to the location of the user, with participants aware of the impacts of this in terms of system performance and its effects on their own behaviours. These direct observations were solely made by native users, which is interesting that non-natives would not consider this as Aula & Kellar (2009) found multilingual

participants to use location specific facilities when searching for local information. In one case, participant D, a non-native English user, refers to tailored results in passing.

> "When search for housing it was the only one for local. I didn't search for North-East or anything connected with this area it just appeared on the list." (User D)

Some participants embraced this and as such their results were tailored, whereas others did not.

> "My Google did it just automatically it asked me whether it could use my location so when you accept it, it kinda updates the pages to more relevant pages for [x] than national" (User K1)

> "It does ask for the location...but then I didn't put in a search indicating my area, but that would be, I imagine, a website where there would be a discussion about the policy and how it affects the elderly living in that local area." (User D1)

Locality is identified as being important with participants making numerous references to the specificity of context and how user location is important to the response required by the retrieved Search result or the document selection (Aula & Kellar 2009). This is especially the case when interacting with local or national government documents.

> "Our location being in Britain, when we Googled, whatever we Googled about Peruvian visa it tend to be British going to Peru so I'd imagine...probably be easier for people in Peru to Google how to get to UK then us to go about for them to come here from here." (User B1)

> "In context, like in housing you could have links to local schemes in your area that are run, that are official and run by the council, so still linked to the government somehow, that might have been good." (User E1)

> "It kind of depends on where you are which local authority you're in so that can make it a bit vaguer in terms of what you can find out. If it [x] for

instance you can find out whether the library are putting on elderly digital literacy courses but you can't really do that just on a, it's a national protocol but the speed at which it's implemented is different." (User B1)

7.5 Visual design and appeal

Visual design and appeal is related to participants identification of the use of imagery, and the layout and design of documents.

7.5.1 Use of imagery

Imagery is noted, not due to the lack of its importance, but the lack of presence in the transcripts, something that was not expected as previous studies found imagery to be of importance (Chu et al. 2012, Rózsa et al. 2015). It was mentioned only by non-native participants in two out of the nine sessions. What was most interesting is that there was a higher proportion of support for a lack of imagery use, although its use is well defended, and appears to make a logical argument for its inclusion, this appears to not be the consensus amongst the participants.

"For me I don't want more picture or photo. Now it's OK." (User C)

"Make use of white spaces, personally I don't like distractions like images or things down the side." (User I)

"Less quality of the experience, the font and everything. I think they all follow the same structure. The NHS has a very nice thing, the theme of the page has sound kind of image that connects to that theme. So, when you look at that image you immediately identify what is that page about...it is basic image...they have the text but also the image...it is for all types of people some people are very quick and some are not, some people have the ability to read well in English and some people don't." (User D)

7.5.2   Layout and Design

Layout and design is of significant importance to participants as they made extensive comments regarding the user centred design of web documents.

> "there was one website with the menu bar down the left, I prefer the menu from the top because it is easier for me to search for the information and instead of scrolling from right to left I prefer to scroll up and down. this distracts me if I have to scroll right and left." (User J)

> "Kind of makes you feel like you're in trouble, like if you go to look for summit, it's like they're accusing you of something, I suppose. Not like their language or anything just, I dunno, it just reminds you of like prison is suppose like, it's weird, very dark colours. " (User M1)

Visual design and appeal of both governmental and non-governmental web documents were brought up numerous times by users and appeared to be quite polarising with participants for or against the design. Users had specific notions of appealing design, including the use of images (adverts) and whitespace, which would dictate whether time would be spent on said document, a phenomena previously identified by Chu et al. (2012), Leu et al. (2005, 2017), Martzoukou & Burnett (2018), Nielsen (2011), Rózsa et al. (2015).

7.6   Content and Navigation

The participants considerations towards content and navigation are made up of the sub-themes of targeted audience, Search Engine results, trust and user judgement.

7.6.1   Targeted Audience

Targeted audience is a subtheme related to the content of documents seemingly targeted nature to a specific audience or entirely generic, almost to the point of being so vague as to be useless. These extremes were not solely linked to governmental or non-governmental documents, although generic content was more likely from government, albeit in a more technical language (Aham-Anyanwu & Li 2017).

"In some ways they do have to stand apart and just tell you the legal position and make it very generic and that's why you turn to other sources." (User E1)

"I think display the simple stuff first and then if people want further information they can go find that rather than the complex information first and then having to sieve through it to find the basics that you want. Just so that even if it's something that you passively reading you can get a gist of it rather than just think aw I'm not going to read that cos it looks too complicated." (User J1)

"Very user centric, erm, as opposed to being focused on providing generic information to everybody." (User A1)

"I think display the simple stuff first and then if people want further information they can go find that rather than the complex information first and then having to sieve through it to find the basics that you want. Just so that even if it's something that you passively reading you can get a gist of it rather than just think aw I'm not going to read that cos it looks too complicated." (User J1)

"Any government website I used set the criteria out which was very like technical language and if you go, I did actually click on the guardian link, which kind of was more layman terms when at our level we can look and understand it. So, I dunno if that's just because what the information had to be precise or did they target the audience reader who'd be researching it." (User J1)

"That was the task where the government sites did not have the information, I was relying on the news websites, the guardian and the independent to what is the task about, what is digital by default" (User G)

"With the digital by default stuff is that everybody is obviously writing about it, what's happened we have to comment on it, erm but sometimes it was quite hard to see if there was enough in there that was going to be particularly relevant for people with concerns...There seemed to be a lot of sort of expert

people viewpoints but there didn't seem to be anything that really makes it accessible for the people that are going to be directly affected by it...I don't feel that the government websites are fully recognising their audience in the way that they present the information. You know, who do I need to speak to, is actually a very important question that they possibly could put down a little more" (User D1)

Freund (2010, 2013) and Nam (2014) identified that judgement of relevance and context dictated citizens use of governmental content, whilst this study has demonstrated that governmental content also plays a part in users' willingness for interaction, with a number of participants indicating a reliance on non-governmental content due to language complexity (Aham-Anyanwu & Li 2017).

7.6.2 Search Engine Results

The effort it took to often find governmental content in the search results was noted with some users relying on Google to find the exact gov.uk page they required (Freund & Berzowska 2010). Others were less specific on the page they wanted, just that it was a governmental document, however they note that the documents were often ranked low on the results page, requiring more effort to search.

"I think also, erm, you know how you can, erm, setup a website so that it does actually go higher in the hits, ends up with a higher, they might want to have a look at that so erm the sort of simplified explanation and the practical explanation actually appears pretty early on when people, and, and for a range of searches so that actually comes through in lots of different ways that people might try and search that information" (User D1)

"There was just one thing that often the government websites were not the first search results you had to actively look for them, like we didn't know that the government website existed, you might not find it...the only one that was obviously, the government website was obviously there was the visa one but all the other ones you actually had to look for the government website" (User K)

"With Google I don't need search because google gets me to the page I want to be. after you search for a visa it takes me directly to the page. for everything else it takes me directly to the page. I think the clarity of the information is more important. I think there was only one thing missing, the digital by default, that was a bit eh...some 'about' information was needed other than just their 18-point criteria. Visa was spot on." (User G)

The participants demonstrate an understanding of their information need, by delving further into the search results page to identify required (governmental) documents (Freund & Berzowska 2010). As indicated in the studies in the mixed methods phase, this differed amongst the natives and non-natives, raising question about their search strategies as witnessed in similar studies (Józsa et al. 2012, Park et al. 2014).

7.6.3 Navigation

Navigation is in relation to participants perceptions about the direct or indirect route required to find information on documents.

"It's meant to be a gateway, and I know that concept at the start was actually life, what happens in your life and then that helps you work out where you need to go so birth, school, erm university, work, housing, so all those things that is kinda meant to be your sort of life trajectory and they never get the sort of feeling that that's actually what's going on and I wondered if there's some sort of gateway prop to that the government portal that would actually ask questions rather than expect you to like, when we got on to the visa page it was really really helpful but maybe they need something a bit earlier on to help people." (User D1)

"I think some of the websites that have many stages to get to directly to the point. It should be direct. its information about the government, it should not be like non-government...On gov, it's more direct. The information is there, are not many links, there are not many stages to get to the information. We can also tell from the user interface as well. I found that the gov website is more easy, more easy to get and retrieve the information. " (User J)

"I used them [local government documents] a small bit, but I have other experience that their websites are just so hit and miss. Some are just endless loops of nothing where you just follow links and never get to what you want, and others could've been from 15-20 years ago and have all been abandoned. A lot of authorities concentrate on having twitter or a Facebook but some are alright. But certainly not in keeping with the government theme where everything has to be along one sort of template. " (User B1)

The extent to which a participant will follow links, or forage, to obtain the information they seek has been noted (Pirolli 2007) and observed in similar studies (Kralisch & Berendt 2005, Józsa et al. 2012). This willingness to traverse multiple documents raises questions once again about search strategy (Józsa et al. 2012, Park et al. 2014), about the extent to which participants are actually reading the content (Grabe 2009, Aham-Anyanwu & Li 2017, Marchionini 2008, Coiro 2011), and more importantly judging the validity of that content (Park et al. 2014, Berendt & Kralisch 2009). Forcibly ensuring users must navigate to documents of relevance, increases the risks of information overload (Kim & Allen 2002, Brennan et al. 2014), and in the case of local governments, increase the likelihood of a lack of uptake (De Jong & Lentz 2006). Although not quoted here, anecdotally one non-native participant was quite shocked that local government could be utilised at all to complete these tasks.

7.6.4 Trust

Participants identified trust of a source, and in turn the trust of a documents content, as being often difficult to establish. Establishing the authenticity of the content, that is, if it is governmental (and therefore official) or not, was noted as a concern.

"When you got on to gov.uk you knew you were on a government website and sometimes you might get like a reference to <unknown words> that seemed to be kinda coming from the government source, erm, but some of the other websites you weren't always quite sure what their origin is." (User D1)

"The visa one, not for myself but for someone who has little grasp of English, there were a lot of websites where it looks like it was from the British

government but actually is probably a private business that's looking to take some sort of royalty on acquiring a visa for a higher rate. But it's sometimes difficult to differentiate them. " (User B1)

" I think it's important for government websites to have, to be better than non-government websites because you know, otherwise people will err turn to those non-government websites and there could be some err I think mm some you know shady things going on you know trying to make money out of, I mean the government is not out to make money I guess out of these services but private companies might you know, you gotta be careful. I think government are more, you know, more trustworthy " (User Q)

Trust in government has been found to be superseded by user' trust in the technology, namely the 'e' aspect of e-Government (Nam 2014), however that was not the case for participants in this study. This may be due to extensive use of e-government services (Bélanger & Carter 2006, 2008, 2009), although this view of governmental credibility, which can affect a user's choice of source (Higgins 1999), appears to have been exploited by non-governmental information (and often paid for service) providers. Although this was raised by one native participant in particular, a number of participants did bookmark documents of such paid for services.

7.6.5 User Judgement

User judgement is related to the skills the participant utilises in judging a documents' use. These include judging relevance and timeliness of a document's contents (Borlund 2003*a*, Jiang, He, Kelly & Allan 2017). It also relates to judging a sources reliability and validity (Berendt & Kralisch 2009, Park et al. 2014). This was especially the case for local governments, with several users, especially non-natives, struggling to confirm whether a document was for local government (De Jong & Lentz 2006, Wirtz & Kurtz 2017).

"I remember going on to one of the websites, can't remember what it was, but I couldn't find a date for when the information was uploaded so that was why I couldn't judge whether it was relevant or not and I don't think it was

a government one and I didn't know what had prompted it, whether it was in response, I think it was the digital default, by default thing, erm whether it was in response to that so sometimes it was difficult" (User D1)

"I think maybe like, I went on the NHS website and on the Visa one there was a lot of redundant information like stuff that's outdated that's just not been updated and you kind of end up going in this loop of this was changed on this date click here and then it just keeps going on, so maybe just a general clean-up of information that isn't relevant anymore." (User K)

"I think for visa; government website has more authority and if you want to know something about how it affects life so maybe something in newspaper I suspect is more relevant. Something like digital by default I don't know what's that so if I want to know what's that exactly, so government website is more authoritative." (User F)

"I think that the problem with the government, the gov.uk, and I sometimes find this, is it doesn't really tell you the full story. It just tells you that sort of briefly, to kind of reassure you, whatever, but what you want is practical information if you're an elderly person, practical information, how's it going to affect you then and there." (User D1)

"I found some web pages that look like local but I'm not sure, because quick searches. Some domains are new for me but just in case I took the information I didn't have time to validation I just keep the information if I have more time I do the validation." (User E)

Reading skills (Grabe 2009, Aham-Anyanwu & Li 2017, Marchionini 2008, Coiro 2011), web experience and familiarity with web document conventions (Bilal 2004, Leu et al. 2005) improve the likelihood of a user ensuring the validity of content (Berendt & Kralisch 2009, Park et al. 2014), providing time is spent on actually reading the documents. A point this study has demonstrated, which leads to improved performance.

7.7 Context

Context is a theme related to the participants perceptions of the experimental conditions, including the scenario context, and how this may differ in a more naturalistic setting.

7.7.1 Scenarios

"The scenarios were within themselves fine, but there was a lack of specificity with, you would know the people. The one where they're coming to visit you while you are in the UK, that suggests I might not be a UK national anyway " (User A1)

"It was too general and I did learn that I could search for specific things as I went on but at the first task what was the objective? What was he asking of me? " (User D)

"I think they all were believable but not all of them were quite relevant to me I would say. The fourth task about digital by default, I never heard of it. Yeah and, eh, so it's not something that I would know about I think. " (User Q)

General consensus amongst both groups of participants were that the task scenarios were relevant and believable, however lacked specificity in details.

7.7.2 Naturalistic information seeking

Despite author expectations there were no mention of participants using official services in a face to face capacity. When explicitly asked how they would conduct such search tasks in a more natural setting little to no reference is made to the hardware (device) in which they use to access on-line information, but both groups do make numerous references to utilising web search (Google), professional services, such as the NHS, or their social circles in the first or second instance. For the non-native participants these social circles were made up of peers and friends rather than family, but this is no surprise considering their current circumstance, in that they are overseas (international) students in the UK with limited physical access to family members (Helbig et al. 2009, Vinson 2009, Lloyd et al. 2013).

"We actually ended up meeting somebody who knows all about the immigration and we'd found that we'd missed a few bits and we had to add some extra documents." (User D1)

"For all the scenarios I would ask my friends first because that is easier. I'd ask my friends and see how they say" (User F)

" First I'd try with Google and then I'd try friends who had been here " (User H)

"We have time to Google, it's not an emergency case where you don't have time to Google. Walking down the street someone would approach and ask about a visa application. It doesn't happen. " (User C)

"I think I would try talk to a real person rather than try and find the information for myself, especially with the visa questions and the housings ones, I'd try and find an advisor at uni or some kind of service or something like that. I dunno, I'd use the internet but only if I couldn't find information from, because there's so much to sift through and so many results it's just easier if someone knows what they're talking about. " (User O)

"For the digital by default, yes only Google, the only one that is different is, for the housing one I find it easier to visit local notice boards, and they usually have flyers there and people are advertising locally. That's the first place that I check and then I go to gumtree. The medical thing I would never, even though I feel I found the exact symptoms describe and everything I would prefer to go to the walk-in centre then search online." (User G)

"I would use, I quite rely on Google as well. for the visa I would ask some international students I'm working with. combining google and direct relationships with people who might be informed about these topics." (User M)

A large proportion of the reliance on third party experience was in an alternative experience context, in that, they had not used these services prior but had this been a real-world

scenario they would refer to experts, friends or family in the first instance to resolve such a task. This was especially the case, with experts, for the health task, and social circles for housing. Although anecdotal and not transcribed, three members of the initial phase study did confirm, that they had employed the services of agents for their own visa applications, negating their own need for interaction with the gov.uk website.

7.8 Summary

This chapter has identified five themes and fifteen sub-themes from the post study focus group data. These themes incorporate explicit and implicit recommendations towards the design of governmental content, document layout and online systems. In the following chapter the implications of the findings will be discussed alongside the previous results outlined within this thesis.

Chapter 8

Discussion

8.1 Introduction

This chapter will discuss the findings of this thesis as detailed in chapters 4, 5, 6 and 7. Chapter 4 details the design of online search tasks by employing a Participatory Design approach to identify ESL users perspectives on what constituted e-governmental services and those which were of most use (to those users). Building on this identification, the same users analysed problems surrounding such services, factors that cause the need for the service and the effects of the service. They also identified the information needs of service users, potential information sources and the necessary skills required to resolve these information needs. The outcome of this was the identification of a number of important topics to the users, with the visa topic identified as most important. The process by which these topics formed the context from which search tasks could be derived is detailed in chapter 5 along with the findings of ESL users' interactions with governmental and non-governmental online systems and content. These results also identify differences within the group of ESL participants, regarding their confidence when judging their own abilities in formulating queries in English, identifying relevant search results and information on websites. These differences implied implications on performance and an importance on search strategy highlighted. Chapter 6 describes additional findings on these interactions of ESL users in comparison with native English users identifying noticeable differences, as would be expected, but several similarities in performance and behaviours. Chapter 7 presents the themes and subthemes extracted from the transcripts of post-study focus

groups from all participants through the comments and recommendations provided. This section shall discuss the findings from these chapters in relation to the literature and in reference to the concept of Information Interaction, demonstrating the findings through the complex connections of the user, the content and the system. Firstly, section 8.2 will discuss the use of Participatory Design in Information Interaction studies, section 8.3 presents the findings of participants' interactions, performance, experiences and skills, section 8.4 presents the findings of participants' interactions with the content and section 8.5 details the findings of participants' interactions with the systems.

8.2 Participatory Design and Information Interaction

Extant research identified a need within Information Interaction research to establish contextually relevant and engaging search tasks and scenarios for users to conduct (Borlund 2003*b*). The work within this thesis has demonstrated, in chapter 4, a Participatory approach to not only identify relevant search task topics, but to establish the factors which may cause and affect such topics and discern the information needs and necessary skills that may bring prospective users to conduct such search tasks. These topics and factors were considered in the development and prototyping of said search tasks, which were implemented in the study and experiment detailed in chapter 5 and chapter 6. Feedback from the studies, both explicitly through participant feedback and implicitly through participant performance, would suggest that formulation of search tasks through this approach was highly effective. From a complexity perspective, the tasks appeared to challenge both sets of participants and to be relevant to more than just the study target population. This provides scope for the use of these tasks in other studies, with varied demographic populations. For future studies of Information Seeking or Interactive Information Retrieval, utilisation of a Participatory approach, would have profound impact on the development of search tasks/scenarios but also on the user engagement and user experience perspectives of these studies through participant reflections, feedback and recommendations that are derived from these studies as detailed in chapter 7. Although in this research participant inclusion in the formulation of the tasks was limited, it can be assumed that should users have more presence at that stage, then contextual relevance would be higher. This

would also go even further to address Borlund's concerns (Borlund 2003*b*).

8.2.1   Summary of key findings

Feedback from the studies, both explicitly through participant feedback and implicitly through participant performance, would suggest that formulation of search tasks through a Participatory approach was highly effective. From a complexity perspective, the tasks appeared to challenge both sets of participants and to be relevant to more than just the study target population.

8.3   Users

This section details the user aspect of the information interaction relationship, focusing on participants perceptions, experiences and skills and their effects on task performance. Participants within this research were required to self-assess their own search capabilities and language proficiencies, as such, both groups judged themselves to be highly IT literate, with all native English participants identified as having excellent search skills in the English language. There was somewhat of a disparity between the ESL users in chapter 5, as half were very confident in their search capabilities, the other half less so. When considered as a whole, the ESL group were observed to overestimate these search capabilities as noted by Marlow et al. (2008), with half of all documents judged as irrelevant or tangentially relevant to the tasks. Despite the native group bookmarking fewer documents per task on average they performed marginally better, in terms of average precision, than the non-natives overall (chapter 6). Both groups, when judging perceived task difficulty, were unable to successfully predict how well they would perform, with those performing best in cases where they expected to perform poorly. Comparisons between ESL skills confidence levels within chapter 5 and native and non-native within chapter 6 demonstrated several significant findings in relation to participants' information seeking behaviours. Unconfident ESL users spent more time reading documents and spent more time on the Search Engine Results Page (SERP). Although confident ESL users spent less time reading, native English users were observed, in chapter 6, to spend more time read-

ing documents than ESL participants, albeit not significantly so. Suggesting that English language proficiency may not be the sole cause for the confident ESL users' behaviours. These findings are an indication of the importance of passive language skills (Aham-Anyanwu & Li 2017, Coiro 2011, Grabe 2009, Kralisch & Berendt 2005, Marchionini 2008), as chapter 5 and chapter 6 demonstrate that for every additional second ESL participants spent reading documents, the expected performance (in terms of precision) increases, and significantly so. What is interesting to note, is that this was not the case for native participants. Non-natives were observed to spend more time and delved deeper into the SERP. There is clearly some understanding of their information need, unsurprisingly considering the method of topic formulation, as participants were delving further into the search results page to identify required governmental documents as noted in the subtheme *Search Engine Results*, which has been identified in a similar study (Freund & Berzowska 2010). This is interesting when reflecting on the role of the search engine, and users trust in the higher ranked documents (Pan et al. 2007, Nielsen 2011) against the trust and authority placed in the source of the material (Tombros et al. 2005, Pan et al. 2007, Ondego & Komlodi 2017). The implications of this, in terms of a service provision, are discussed in section 8.5. Other significant findings were with participants writing skills, namely their query formulation skills and link following behaviours. Chapter 5 observed unconfident ESL participants submitting fewer queries and spending more time doing so. If we observe the types of queries which were submitted, confident searchers used more "reformulations" and "specialisations" compared to unconfident searchers who resorted to more frequently starting a "new query". When combined with the observation that the confident group also had more failed queries (that is, those with zero SERP clicks), it can be suggested that they have the confidence to reject a query by assessing that results are poor and are less likely to start again, as in the case for the unconfident group. In a similar study, this was also observed due to a lack of vocabulary, knowledge of synonyms and understanding of technical language (Rózsa et al. 2015), and a reasonable conclusion in this case. It is curious, however, that despite this possible confidence issue, use of assistance was no different between the two group, possibly because the unconfident group submit shorter queries, or perhaps due to participants awareness of experimental conditions.

When comparing natives and non-natives in chapter 6, natives submitted more queries yet spent less time querying although query length was the same for both. There was very little difference between the two groups in terms of the types of queries submitted, and a quarter of all queries submitted resulted in zero SERP link clicks for both the native and non-native groups. This is a reasonable indicator that they are equally proficient in identifying when a query or SERP link did not meet their information need. When judging the accuracy of the queries, non-natives made most spelling errors (16 compared to 5) but this was a small number (and percentage) of instances. It must be noted that although use of assistance was low in chapter 6, non-natives use of auto-fill was significantly higher than for native users. The subtheme of *Convenient or necessary support* notes participants acknowledgement of their reliance on such features to speed up the search process or account for their mistakes, a point noted in the work by Rózsa et al. (2015) as well, however, it was native users who appeared to be much more open to acknowledging their use of these features, confirming it as both a convenience and a necessity. As noted already, search experience and IT use were self-assessed as being high, and a large proportion of both groups also had UK government e-services (domain) experience or knowledge. Web experience and familiarity with web document conventions were evident in the strategies employed. One such example from chapter 6 was a non-native users entering of direct URLs rather than searching for keywords, and then link following or using in-site search, which were also observed through the theme *Knowledge, Experience and understanding* and have been identified in previous research, where familiarity with the web was seen to improve performance (Bilal 2004, Leu et al. 2005, Borlund et al. 2012). However, the element of lack of awareness or their over-confidence in their own ability appear to have, in certain tasks, a detrimental effect on performance, demonstrating how essential participants self-awareness of their skills and abilities are (Marlow et al. 2008). This self-awareness can be accounted for to improve the likelihood of a user ensuring the validity of content providing time is spent reading the documents (Berendt & Kralisch 2009, Park et al. 2014), equally stressing the awareness of and application of search strategies (Aula & Kellar 2009, Józsa et al. 2012, Park et al. 2014). This raises considerable issue over *user judgement* (subsection 7.6.5), especially when considering the relevance of docu-

ments (Tombros et al. 2005, Ondego & Komlodi 2017). This has implications from a support of skills perspective, in that, service providers and systems designers can only offer so much support with autofill or recommend a link, if users do not perceive a need to use such features then the importance of self-awareness becomes even more important. In this case, search skills training would be recommended. There is a realistic chance, however, that users are unable or unwilling to acknowledge the need for such training as such the following sections will demonstrate additional courses of action that could be taken from a content or systems perspective.

8.3.1 Summary of key findings for User

- ESL group were observed to overestimate their search capabilities with half of all documents judged as irrelevant or tangentially relevant to the tasks.

- Both ESL and native groups, when judging perceived task difficulty were unable to successfully predict how well they would perform, with those performing best in cases where they expected to perform poorly.

- For every additional second the ESL participants spent reading documents, the expected performance (in terms of precision) increases, and significantly so.

- ESL users spent more time on and delved deeper into the SERP. Governmental documents were noted as being lower in the SERP rankings, which may account for this behaviour.

- Confident ESL had more failed queries and more reformulations suggesting that they have the confidence to reject a query by assessing that results are poor and are less likely to start again, as in the case for the unconfident group.

- Although natives submitted more queries and spent less time doing so and spent more time reading documents than the ESL group. For both ESL and Native groups query length, types of queries and the percentage of failed queries was equal.

- ESL participants used significantly more query assistance than natives, although still a low percentage of their overall submitted queries. Natives were much more

open and honest about their reliance on such features.

8.4   Content

This section details the content focus in the information interaction relationship. It will explore aspects of performance considerations from chapter 5 and chapter 6 and incorporate the thematic considerations from chapter 7 including recommendations. In preparation for this study the author conducted each search task by means of seeking solely governmental or non-governmental content, identifying that this was indeed possible. The study, therefore was to observe if and how the participants resolved these tasks, and the nature of the content that was used to do so. In chapter 5 there was little difference, in terms of relevance, between governmental and non-governmental resources. While in chapter 6, despite both groups relying on similar proportion of non-governmental documents, and although the non-natives bookmarked a larger number of documents, their performance is lower. Both groups selected the most governmental documents for the visa related task, and the least for the housing task. Both groups selected approximately equal governmental and non-governmental documents for the digital by default task, and were equally as poor at distinguishing the relevance of these documents. This was mostly due to some participants bookmarking internal policy documents or documents discussing best practices for civil servant software engineers which were deemed to be only tangentially relevant and unlikely to be of help in the given contexts. This mirrors points raised in the previous section regarding users struggle to balance contextual relevance with (governmental) document trustworthiness and, therefore, reliability. It is curious that despite acknowledging the lack of contextual relevance in some policy documents, there was still a large proportion of users who bookmarked said documents (Tombros et al. 2005, Crystal & Greenberg 2006, Pan et al. 2007, Ondego & Komlodi 2017). Due to the lack of think-aloud data and the immediacy of the post-discussion to the experiment it was not possible to ask participants directly on this matter, however it could be surmised that the users trust in government content overrode the relevance judgement of those documents. Alternatively, it could be that the task scenario left it open to interpretation and that those participants interpreted that these documents would be useful in this context. The final consideration is

that the users were unable to ascertain the relevance with any certainty and so selected the documents. In light of these differences between the tasks it is unsurprising that there are observable effects in terms of their complexity (Liu, Cole, Liu, Bierig, Gwizdka, Belkin, Zhang & Zhang 2010, White 2016), relevance assessments (Saracevic 2016, Jiang, He, Kelly & Allan 2017) and participant domain knowledge (Bilal 2004, White et al. 2009, Chu et al. 2012, Józsa et al. 2012, Arguello et al. 2018, Weber et al. 2018) and their effects on performance. Freund (2010, 2013) and Nam (2014) identified that judgement of relevance and context dictated citizens use of governmental content, whilst this study has demonstrated that governmental content also plays a part in users willingness for interaction, with a number of participants indicating a reliance on non-governmental content due to language complexity in subtheme *Targeted Audience*, a point also raised in the study by Aham-Anyanwu & Li (2017). A solution as suggested in subtheme *Targeted Audience*, is offer a layman term abstract or overview of any policy document(s), which would go some way to reducing information overload and address the issues of language complexity. This would aid in the promotion of digital citizenship (Mossberger et al. 2008), and help to promote a more transparent and trustworthy e-government (Venkatesh et al. 2016). Imagery has been found to act as a support to ESL users when content was technical or complex, yet in this study, imagery is noted for its limited but negative mention. When argued for, the defence of image use is well formulated, considering the literature's support (Chu et al. 2012, Rózsa et al. 2015). The subjective nature of the against argument and the importance of simplified content (theme *Targeted Audience*) would suggest that, minimal but effective visual support should be promoted. Of course, from a national government perspective, a more formal facade may be expected (*Targeted Audience*), so this use of imagery could be useful to engage and retain users of local governmental content as subsidiaries like the NHS do (*Use of Imagery*). There were very few local government interactions during the experiments (as noted by (De Jong & Lentz 2006, Sandoval-Almazan & Gil-Garcia 2012) and those users that did were non-committal as to whether they had. Most of the post study comments on the matter were from participants' previous experience, with little positive feedback. Major concerns were about credibility of the content, non-standardised design between constituencies and prior knowledge of their

existence or capabilities. If you compare the use of the NHS during the health task, which is explicit in its identification, and its uniformity across departments and trusts users were more likely to bookmark such sources and did. Of course, the NHS was likely to be more well known by these participants than Newcastle city council, however, it stands to reason that local government e-services should heed such design considerations, before a solely digital service provision can become a reality.

8.4.1 Summary of key findings for Content

- There was similar proportion of non-governmental documents bookmarked between ESL and natives, with little difference, in terms of relevance, between governmental and non-governmental resources

- Governmental content shown to play a part in users willingness for interaction, with a number of participants indicating a reliance on non-governmental content due to language complexity

- Despite use of imagery's mostly negative reception by ESL participants, minimal but effective visual support should be promoted among local government and subsidiaries.

- Local government systems and content were rarely utilised, with most comments derived from past experience and negative in sentiment.

8.5 System

This section details the system focus in the information interaction relationship. It will explore aspects of performance considerations from chapter 5 and chapter 6 and incorporate the thematic considerations from chapter 7 including recommendations. From a systems perspective, service providers have the means to support users in a multitude of ways, providing the users themselves have the means and willingness to employ such support mechanisms. An example is Google's support of query formulations through autofill and recommended links. chapter 5 demonstrated equal use between the confident and uncon-

fident ESL participants, however chapter 6 observed a significantly higher proportion of use by ESL participants than natives. This usage still accounted for only 6% of all queries submitted and made little difference to the number of failed queries, with both groups relying on their own abilities to identify when results did not contain sufficiently relevant documents. Alternatively this could be a result of the rank to which documents were assigned. Government documents are identified in subtheme Search Engine Results as being low on the SERP ranking, which could account for both the time spent and depth of search on the SERP. This may explain why the non-natives both search deeper and longer than the native users, who bookmarked fewer governmental documents. Therefore, for those users who identified failed queries, was it due to their observation that results were not of suitable quality or did they not delve deep enough into the SERP, thus missing potentially relevant documents? (Pan et al. 2007). In instances where participants of chapter 5 could utilise web search and in-site search features, usage was varied, with participants found to be navigating through the use of in-site search and in-site click-through, although use of in-site search was limited to just a few users with few occurrences. Other ESL users in the study observed they got better results from Google than any in-site search (in the past) and that it was just as quick to go back to the search and start again than use the website's in-built functionality. This exploitation of 'resources' rather than exploration of web documents is exactly as described by information foraging theory (Pirolli 2007) and behaviours noted by (Berendt & Kralisch 2009). Within chapter 6, there was also limited use of the in-site feature, and no notable mention from native users as to its usage. This is, perhaps, in part due to the trust placed in the results presented by major search engines (Pan et al. 2007, Nielsen 2011) and the lack of trust in bespoke search or unbranded systems. These behaviours appear not to be specific to any content or source, as such, there is some way to go for users to reap the full potential of the in-site search function. The topic of trust was a recurring theme for participants and has been identified as a driver for the selection of content even when relevance was questionable (Pan et al. 2007, Ondego & Komlodi 2017). This could be attributed to a users perception of trust clouding their judgement but is a key indicator of the mediating and moderating effect that e-government (Horsburgh et al. 2011, Venkatesh et al. 2016), most notably, access to and

authorship of digital content (Tombros et al. 2005, Crystal & Greenberg 2006, Ondego & Komlodi 2017), can have on use of said content. Through chapter 5 and chapter 6 those participants who found the visa section of the gov.uk website, which utilises a wizard to guide users systematically through, the process was simplified and informative and was the cause for the increased number of in-site clicks and performance. For those users who did not find the features or in other tasks, where such features did not exist, clickthrough and performance were worse for both ESL and natives. For any process driven service, such features are highly recommended by the participants, see subtheme *Navigation*, and participant performance confirms the advantages. For those services which are less process driven or have a more subjective nature, support of users could be made through practical case examples, to offer guidance and improve digital citizenship (Mossberger et al. 2008). Detailed in subtheme *Convenient or necessary support*, this would provide practical suggestions as an example, or offer guidance on non-governmental support. Similarly, offering suggestions of related searches (as seen in Google) and recommended by participants of (Rózsa et al. 2015). There are other forms of assistance or advanced features designed to support users and are recommended by participants in chapter 7. However, they do suggest the teaching of these skills, but question there use after implementation, which was also identified by Rózsa et al. (2015). Participants mention user's lack of knowledge on how to use Boolean operators, confusion of such features and the added complications such features may bring, which has also been identified by Eagleton & Guinee (2002). The subtheme of *Locality* is identified as being important with participants making numerous references to the specificity of context and how user location is important to the response required by the retrieved Search result or the document selection. This is especially the case when interacting with local or national government documents especially for the visa and housing tasks. Although not quoted here, anecdotally one non-native participant was quite shocked that local government could be utilised at all to complete these tasks. In this research, uptake of Google use was absolute, due to the experimental conditions, however, in other similar situations but different conditions, participants were keen to stress, that they would refer to experts or social groups in the first instance for health, and first or second instance for housing related tasks. Despite

researcher expectations there were no mention of participants using official services in a face to face capacity. When explicitly asked how they would conduct such search tasks in a more natural setting little to no reference is made to the hardware (device) in which they use to access on-line information. Both groups do make numerous references to utilising web search (Google), professional services, such as the NHS, or their social circles in the first or second instance. For the non-native participants these social circles were made up of peers and friends rather than family, but this is no surprise considering their current circumstance, in that they are overseas (international) students in the UK with limited physical access to family members (Helbig et al. 2009, Vinson 2009, Lloyd et al. 2013). Considering a potential digital only service, and despite positive comments towards NHS and enterprise online systems, social considerations were still highly sought.

8.5.1 Summary of key findings for System

- Web search results page rankings play a large part in the utilisation of governmental content, but so too does user search strategy.

- In-site search is barely used, with no specific link between this behaviour or the content or source.

- Governmental Visa service utilises a wizard system for applications that has demonstrable positive impact on performance across all groups.

- For less systematic processes, participants recommend contextual case examples for user support.

- In similar circumstances, outside of an experimental environment, participants would refer to experts and social groups for housing and health tasks.

- Considering a potential digital only service, and despite positive comments towards NHS and enterprise online systems, social considerations were still highly sought.

8.6   Summary

This chapter has summarised the findings of the main chapters of this thesis, discussing the implications in relation to the three relationships within information interaction (Figure 8.1, users, content and system.
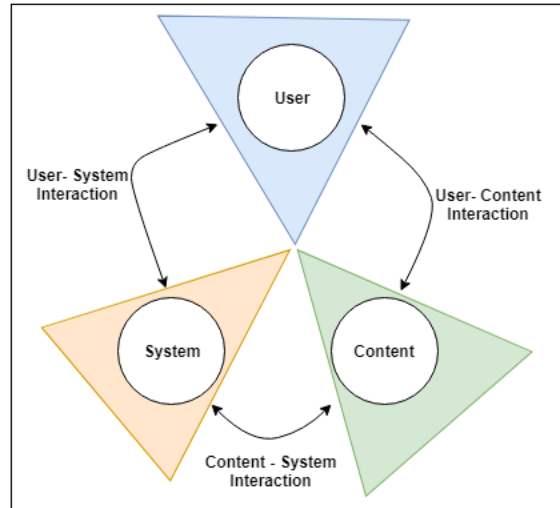
Figure 8.1: Model of Information Interaction, adapted from (Toms 2002, pp.859)

The following chapter will conclude the thesis, discussing the findings in line with the research aims and objectives, the research's contribution to knowledge, limitations and author reflections.

Chapter 9

Conclusion and Future Works

9.1   Introduction

The research aimed to identify the current information seeking behaviours of ESL users when performing e-government-related tasks, to ascertain where and why issues arise during this process and how their behaviour differs from those of native English speakers when performing the same tasks under the same conditions. The objectives of this thesis, as detailed in the research questions in section 1.3, were:

RQ1 How do English as a second language (ESL) users search for information?

RQ2 To what extent do these behaviours and interactions differ from native English language users?

RQ3 Can potential differences be supported by the search system?

These three questions make up the structure of section 9.2, detailing how the research in this thesis' contributions to knowledge, section 9.3 acknowledges the limitations to the research and future works, and section 9.4 concludes.

9.2   Contribution to knowledge

9.2.1   ESL users search for information

The first objective of this thesis was to identify how ESL users search for information in a e-governmental context. The literature review in chapter 2 identified particular importance in the search strategies employed, and the role language plays in a ESL users selection of online documents, both in terms of the language the content is written in but also their own proficiency in that language. The literature also noted the importance of contextualisation on simulated and real world information seeking. Chapter 4 addressed the contextual relevance of simulated tasks by adopting a Participatory Design approach to formulate task topics by which the task scenarios would be based. The relevance and complexity of these tasks were proven both explicitly and implicitly in chapters 5 and 6, highlighting the effectiveness of an Participatory Design approach for task formulation. Chapters 5 and 6 investigated how ESL users search for information in an e-governmental context. It was discovered that within the ESL group confidence in their search capabilities had significant impact on search behaviour, suggesting success in this context may be less dependent on second language proficiency, as one might expect, but rather highlighting the importance of passive language skills and the fastidiousness of the user in assessing document relevance, and the search strategies employed. Another key finding is ESL users limited but significant use of search assistance on web search but a lack of such use in any other domain. These behaviours appear not to be specific to any content or source, as such there is some way to go for users to reap the full potential of the in-site search function.

9.2.2   Comparison of users

Addressing the second objective, chapter 6 compares ESL and native English users when searching for e-governmental related information. Although there were some marked and statistically significant differences between the groups, most notably the time spent reading documents, and its lack of correlation for natives, despite reading for longer. It also concerned the use of assistance, the time spent on the SERP and the depth delved. There

were also a number of similarities as both groups submitted similar length queries and are equally proficient in identifying when a failed query did not meet their information need. This proficiency was not reflected in their performance in some tasks, with both groups unable to consistently predict when they had not performed particularly well. Another key finding was the similarity between the groups in their bookmarking of documents, namely their preference, or lack thereof, of governmental content.

9.2.3 Search system support

This thesis has demonstrated a highly effective means to support both ESL and native users through the supportive features of a system wizard as detailed in chapters 5, 6 and 7. Other support mechanisms were discovered in chapter 7, from a content and systems design perspective. These include the utilisation of layman term abstracts or overviews for complex governmental content, use of limited but effective imagery for local governmental and subsidiary web documents and the use of contextually relevant case examples. A key finding, in light of potential digital only services, was that in real world circumstances, if faced with similar tasks, participants from both ESL and native groups would refer to social circles or experts in the first instance. This suggests that online support in these cases has someway to go before a solely digital e-governmental service is a viable option.

9.3 Future works and limitations

9.3.1 Sampling

It is acknowledged that the population sample has its limitations with generalising results to a larger population (Boudah 2010, pp.166). These limitations manifest themselves in the areas of age, education, speciality topic, I.T. proficiency and experience and whether they are representative of the non-native English language speaking population. Future works should ensure generalisable hypotheses can be drawn from a larger and more varied user representation.

9.3.2 Metrics

Within these studies metrics were derived from annotated observations. Despite best efforts in these circumstances it is impossible to eradicate human error. Further studies should employ a more rigorous method for the recording of user interactions. To address this issue a chrome extension which records users interactions has been developed, and pilot testing has been complete. Due to technical issues the collected data was not sufficient for this thesis, however, has allowed for the development of a full workable version. It is the aim of the author to utilise this for future studies as detailed within (and beyond) this section.

9.3.3 Think Aloud

Use of think aloud was not enforced throughout the sessions, and it is the fault of the researcher that lessons regarding the lack of use during the first phase of the study were not learned and provisions made accordingly to ensure the methods use throughout the remainder of the study sessions. Recommended actions, which could have been utilised, include warm up tasks as a practice run for the participants before they begun the experimental tasks (Ingwersen & Järvelin 2006, pp.92), more robust instructions as to the rationale behind the method and how they go about thinking aloud, and the inclusion of a control group to ensure validity (Bowles 2010, pp.121). A highlight of the lack of its uptake is that validity and latency (user disruption) are not concerns, however, future works should consider correct implementation of the method to further investigate the implicit relevance judgements and search behaviours of the study population and how they affect their searching as learning.

9.3.4 Document Selection

There are a number of areas to address regarding participant document selection which are intended as future works. Relevance assessments of the documents bookmarked were made by experts in the field of Information Retrieval, however, these users are perhaps not representative of the participants as they were native English speakers. In future works, it could be considered that participants self-evaluate or evaluate the bookmarks of

peers to mitigate these concerns. The author is currently investigating the similarities in participant document selection, to identify how often identical documents are selected, as well as establishing links between reading level and governmental/non-governmental content. It is the aim that this work shall be submitted as a journal article in the near future.

9.3.5 Experimental Conditions

These studies have observed a specific set of tasks in limited time frame, and since conducted the GDS have made amends to gov.uk webpages, systems and functionality. Due to the experimental conditions, future areas of research could focus on a longitudinal study of native and non-native users' interactions with e-government systems. Especially when some of the topics implemented in the experiment could be deemed more suited for long term consideration, such as the housing and visa topics. It has also been observed that users tend to multi task during a session (Mehrotra et al. 2016) and 75% of tasks span across multiple search sessions (Jones & Klinkner 2008), with users picking up where they left off or often re-searching to clarify or re-enforce on information found previously (Kotov et al. 2011, Richardson 2008). Experimental conditions were also an influencing factor in participant behaviours, something acknowledged by some of the native users, and must be considered a factor for other's behaviours also. Although such a controlled study does bring benefits, future work could utilise a more hands-off approach.

9.3.6 Task context

Utilising a participatory approach to establish task context has proven to be quite successful, however, further works should facilitate increased participant inclusion in the formulation of tasks.

9.4 Summary

This chapter concludes the thesis by summarising the contributions in line with the research aims and objectives, acknowledging the limitations to the work but proposing so-

lutions the author would, given the time and opportunity, implement in the form of future works. The findings of this research has demonstrated the effectiveness of adopting Participatory Design as a means to formulate contextually relevant and sufficiently complex simulated search tasks for a wide range of potential participants. The experimental design has demonstrated recommendations that can be utilised in the design and implementation of e-governmental online systems for both ESL and native users.

Appendix A

Workshop Initial Plan

First Session		
Introduce the research Participant introduction Group Values & rules Identify problems & narrow topic Cause & effect in relation to topic Reflect on activities	Explanation Presentation Brainstorm Cards Brainstorm and Cause & Effect diagram Exam condition questionnaire or Individual discussion	To explore social problem
Second Session		
Recall First meeting Survey information needs Reflect	Discussion Brainstorm Exam condition questionnaire or Individual discussion	Identify information needs based on cause & effect
Third Session		
Recall Second meet Introduce experiment Search for information tasks Reflect	Discussion Presentation Experiment Discussion	Identify information seeking behaviour
Fourth Session		
Recall Third meet Survey information seeking behaviour Identify Solutions Reflect	Discussion Discussion and Group work Brainstorm Discussion: learned, understood & future improvements	Explore reflections on tasks
Adapted from (Barbosa Tavares et al. 2011)		

Appendix B

Participatory Workshop Prompts

Welcome Name tags etc

Admin & logistics Pre-questionnaire/ethics forms Fire alarm/toilets etc

Expectations, hopes & fears Ask them!!

Background & purpose

Wider Study How search systems can help to train users to identify effective search query terms and adjust their own performance to adept if required. Interested in the differences in user behaviour and the potential affects information literacy have on performance from the perspective of non-native users.

Context

To set context, In light of governmental e-services, UK's digital by default for example, I wanted to look at the kind of services non-native users need and want with a view to applying these thoughts to the wider context of my study.

The research

This aims to utilise the expertise and knowledge of the user (you). As (potential) users of governmental services you are the experts in your own experiences and needs and therefore I regard researcher and participant as equals, I will learn from you and you will learn from me as we progress. This approach is all about communication, discussion and collaboration. It is a chance for people to teach others about what they know or have experienced, what they feel should or shouldn't be available and more importantly about how their own thoughts and feelings interrelate with others. There are no wrong answers, although some may be outside the remit of the study. Anything brought up that isn't part

of the study or if there are questions, please write them down and if we have time we can discuss them at the end or we will find a way to get them answered. If there are differences or arguments we will discuss, in a moment, how to address these. Remember, as well as there being no wrong answer, there is no one opinion. Everyone has a right to their own thoughts and beliefs. For the purpose of this study we may need to find a compromise, because we have a time limit, but discussions can always be carried on!

Outline Programme

Session 1

- Introductions

  - The research

  - Participants

- Group values & rules

- Identify topics & sort

- Break

- Reasons, cause & effect of topic

- Identify information needs

- Evaluate

Session 2

- Recall

- Introduction

  - Experiment

- Search tasks

- Survey Information seeking behaviour

- Pros/Cons & Solutions

- Evaluate

Introductions Meet, Mix learn who we are!

Clustering -> stand ->cluster named-> shoutout-> seek others -> move

Icebreaker Categories			
Mother tongue	Gender	Discipline	Special experience
Travel time to uni	Zodiac sign	Hobby/enthusiasm	Participation reason
Important issue stance	Time they woke up	Breakfast they had	Fave genre of movie

- Make a line -> long to short (distance, alphabetical, numerical)

- Group values & rules

- Establish norms of behaviour & conduct

- Mutual help, restrain big talkers & help the silent speak!

- How to deal with deviants

- Setup tasks positions

  - Who writes up

  - Evaluators

  - Who gives feedback

Study

Identify topics & sort

Reflect

Buzz groups

Feedback to group & discuss

Sort on the floor

Break

Refreshments

Activity: A's & B's move around the circle avoiding A while close to B. Reverse!

Reasons, cause & effect of topic

Reasons for topics (problems with topic), causes (factors that cause problem/would bring you to need them) & effect (effect of problem, why they are there, what if they aren't)

Identify information needs

Buzz groups – classify the information needs of the user & sources of information from the cause and effects

As a collective – remove redundancies & classify importance

Evaluate

Reflect & write down thoughts - Participants individually talk about what they had learnt; what they did not understand and what needed to improve.

To reflect on and evaluate activities, improve processes and help participants develop critical awareness.

Appendix C

Developed Search Tasks

	Understand	Analyse	Evaluate	Create
	List (Set)	**List (prioritised)** **Description**	**Recommendation**	**Plan**
	Constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarising, inferring, comparing, and explaining.	*Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organising, and attributing*	*Making judgements based on criteria and standards through checking and critiquing*	*Putting elements together to form a coherent or functional whole; reorganising elements into a new pattern or structure through generating, planning, or producing*

Visa	Your friend (from a destination of your choice) wants to visit you in the UK. What visa will they need?	Your friend from Peru and their family (2 members) are coming to visit you for 6 months while you are in the UK. Develop a list of instructions to help them apply for the necessary visas.		
Health	Your friend just got back from studying abroad and suddenly developed a high fever. Dry cough, chills, and breathing difficulties soon followed. What could your friend have?	What are the main things to look for when selecting a health care provider?	What are the different types of services private/NHS healthcare provide? How do they differ? Do you think private or public is best? Why?	A friend is thinking of moving to the West Moor area of Newcastle. They have asked you to make a guide on healthcare in the area. The first step is to figure out the services in the area. Identify what they may need and create basic instructions on how to register.

Housing	You are looking to rent a house. Speaking to your estate agent, what questions would you ask with regard to both you and your landlords health and safety responsibilities	Your friend is trying to decide whether to rent a property or buy one? Recommend which they should choose. Give reasons to support your recommendation.	A family member is coming to the UK to live and wants information on housing. They have heard there are a number of options and have asked you for advice. Identify the options available to them and recommend which they should choose. Give reasons to support your recommendation.	Your sibling is moving to Newcastle and needs to find a home. They have a partner and a small child. Neither adults drive and so need to be close to shops, transport links and a nursery for their child. Create a housing guide with recommendations on which areas to live in with reasons why?

Digital by Default		You have recently heard about the 'Digital by Default' initiative. Find out sufficient Information on the topic to be able to explain how it will affect your family.		Your elderly neighbours have heard about the UK governments 'digital by default' initiative and are concerned about whether this will affect them and their friends at the local community centre. They have asked you to find out more about it. Use your best judgement to highlight what would impact them with reasons for your choices.

Adapted from (Kelly et al. 2015).

Appendix D

Latin Square

Study	Tasks			
$A_{1,2}$	1	2	3	4
$B_{1,2}$	2	3	4	1
$C_{1,2}$	3	4	1	2
$D_{1,2}$	4	1	2	3
$E_{1,2}$	4	3	2	1
$F_{1,2}$	1	4	3	2
$G_{1,2}$	2	1	4	3
$H_{1,2}$	3	2	1	4
$I_{1,2}$	1	3	2	4
$J_{1,2}$	2	4	3	1
$K_{1,2}$	3	1	4	2
$L_{1,2}$	4	2	1	3
$M_{1,2}$	1	3	4	2
$N_{1,2}$	2	4	1	3
$O_{1,2}$	3	1	2	4
$P_{1,2}$	4	2	3	1
$Q_{1,2}$	4	3	1	2
$R_{1,2}$	3	4	2	1
$S_{1,2}$	2	3	1	4
$T_{1,2}$	1	2	4	3

Appendix E

Coding Definitions

Code	Definition
Complications	Participants have been confused by the layout, services or wording of the website (mostly problems with government site)
Country Comparison	Comparisons between how webpages like the government compares to the participants native governments/webpages
Easy Navigation	When the user has complimented how simple it is to gain the information they required from the website (Government based)
Finding Government Webpage	User has explained how easy/difficult it is to find the government webpage through search engines (mainly negative)
Google navigation (negative)	When the interviewee has expressed there frustration at Googles functionality towards the task they were completing
Google Reliance	Participant has purely relied on their results from google to complete a task

Google navigation (positive)	When the interviewee has expressed there happiness at Googles functionality towards the task they were completing
Government General	opinions from participants about the government, that could not be justified to whether it was positive or negatives
Government Negative English	All negative quotes from english participants towards the government website
Government positive English	All positive quotes from english participants towards the government website
Government Positive	All positive quotes from foreign participants towards the government
Government negative	All negative quotes from foreign participants towards the government website
Informative	Users expressing how the government website provided them with adequate information
Interviewer note	Each time the interviewer noted in the transcripts if they were surprised or particularly happy with a response
Lack of imagination	When participants felt the governments website could be improved or their services were not great
Missing information	When participants felt information was missing from the government website
Non-Clear information	When information from the government website was not clear to the user
Other sites	Users talking about the webpages they used in a positive or negative tone

Page Layout Web	Users talking about the page layout of the websites they used and how it influenced their task
Recognisable Government	When users expressed how easy it was to identify the government website page over others
Search Engine Results	When participants mentioned the results they got from the search engine they used
Search Engines	Users talking about the search engine they used in a positive or negative tone
Simplicity	Participants talking about how simple it is to use Google to complete tasks
User Friendly	Participants talking about how the tasks they completed were tailored to their or others needs (mainly government negative)
Web Better information	When users explained the info they received from websites was better then the government official sites.
Website familiarisation	when users said they used websites they had previously used in the past and knew it could help them complete the task
Website services	Participants talking about the services website provide in a positive light
Website problems	Issue participants had with using webpages
Advertising problems	Users complaining about pop-up ads on websites
Can't Trust (trustworthiness)	Participants talking about how they found a website they couldn't trust
Too much Information	Websites having too much information for the participant and confusing them

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