Scent and cues in the forage for Information : the roles of task and topical knowledge in the evaluation of information patch

Lee, Helena Seow Hong

2018

Lee, H. S. H. (2018). Scent and cues in the forage for Information : the roles of task and topical knowledge in the evaluation of information patch. Doctoral thesis, Nanyang Technological University, Singapore.

<http://hdl.handle.net/10356/75724>

<https://doi.org/10.32657/10356/75724>

Nanyang Technological University

Downloaded on 26 Apr 2023 18:48:24 SGT

**SCENT AND CUES IN THE FORAGE FOR
INFORMATION:
THE ROLES OF TASK AND TOPICAL KNOWLEDGE
IN THE EVALUATION OF INFORMATION PATCH**

HELENA LEE SEOW HONG

**WEE KIM WEE SCHOOL OF COMMUNICATION
AND INFORMATION**

2018

**SCENT AND CUES IN THE FORAGE FOR
INFORMATION:
THE ROLES OF TASK AND TOPICAL KNOWLEDGE IN
THE EVALUATION OF INFORMATION PATCH**

Helena Lee Seow Hong

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

2018

ACKNOWLEDGEMENT

To God be the glory and honour for His grace and wisdom!

I am blessed to have crossed paths with very wonderful teachers and mentors, *Asst Prof Natalie Pang (Advisor), Asst Prof LG Pee (Advisor) and Dr Lee Chu Keong (Co-advisor)*, who have been instrumental in the progress of this research dissertation. My sincere gratitude and appreciation for their time and patience in offering constructive feedback and illuminating questions to help me see beyond the horizon.

Examiner panel and Thesis Advisory Committee: Associate Prof Ravi Sharma, Asst Prof Chang Yun-Ke and Dr Carol Soon (from NUS): Despite their busy schedules, they have generously given their time to sit on the Thesis Advisory Committee. I am grateful to the Oral Examination panel, *Prof Schubert Foo, Prof May O. Lwin and Assoc Prof Christopher Khoo* for their provoking questions and critical reviews that are vital for my learning and honing of this dissertation.

Indeed, I would not have progressed with confidence without my advisors', the Thesis and the Examination panels' invaluable advice. Thank you all for your patience and coaching, in helping me established the conceptual clarity, from a broad and vague proposal to a focused work. I have learned a lot from you in this journey.

Special thanks to my fellow doctoral cohorts and friends – I am grateful to *Susan Wong*, for her moral support and her sacrificing time in meticulously edited some chapters of this dissertation. *Wayne Chong*, for his advice on the statistical analysis. And not forgetting *Aravind Sesagiri, Guo Yanru, Pan Wen Jing, Priyanka Dasgupta, Starry Chi and Yvonne Loh* for their generous sharing of knowledge and resources.

"Let the beauty of the Lord our God be upon us, and establish the work of our hands..." Psalm 90:17

TABLE OF CONTENTS

Acknowledgement	i
Table of Contents	ii
Appendices	v
List of Tables	vi
List of Figures	viii
Abstract	x
 CHAPTER 1 INTRODUCTION	1
Research Objectives	5
Research Contributions	5
Structure of Thesis	6
Chapter summary	6
 CHAPTER 2 LITERATURE REVIEW	7
Information Behaviour	9
Information seeking	12
Websites as information patches.....	15
Hyperlinks and information cues	17
User effort in information seeking	20
<i>Research Question 1</i>	23
Task factors	23
<i>Research Question 2</i>	28
Credibility and website evaluation	28
Topical knowledge and task difficulty.....	35
<i>Research Question 3</i>	39
Chapter summary	40

CHAPTER 3	THEORETICAL FRAMEWORK	41
	Theoretical Framework	41
CHAPTER 4	METHODOLOGY	46
	Research Design	47
	Eye-tracking method	50
	<i>Heatmaps</i>	50
	<i>Areas of interest</i>	51
	Participants recruitment	52
	Pilot study	55
	Websites	56
	Procedure and Set-up	59
	Method	60
	Measures	64
	Eye-tracking and Area of Interest (AOI data collection)	66
	Qualitative content analysis and coding	70
	<i>Coding</i>	70
	<i>First cycle coding</i>	72
	<i>Second cycle coding</i>	73
	Chapter summary	75
CHAPTER 5	FINDINGS	76
	Users' effort and hyperlinks	76
	<i>Research Question 1</i>	
	Task specificity and engagement of hyperlinks	85
	<i>Research question 2</i>	86
	Task and users' effort in hyperlinks	86
	Task and navigation	88
	Fixation durations on informational cues	91
	Task specificity and informational cues	93
	Qualitative analysis	99
	Discussion	101
	Evaluations of websites	106

<i>Research Question 3</i>	106
Task specificity and evaluation	116
Topical knowledge	117
Task specificity and topical knowledge	121
Task difficulty, topical knowledge and evaluation	125
Discussion	129
Chapter summary	133
CHAPTER 6 GENERAL DISCUSSION	134
CHAPTER 7 CONCLUSION	149
Contributions and Implications	149
Limitations	150
REFERENCES	153

APPENDICES	182
Appendix A: Informed Consent form	181
Appendix B: Task instructions	183
Appendix C: Survey Questionnaires	185
Appendix D: Semi-structured Interview Questions.....	189
Appendix E: Coding Guidelines	191
Appendix F : Repeated measures_Clicks_Food	193
Appendix G : Repeated measures_Clicks_Travel	201
Appendix H : Repeated measures_Fixation_Food	209
Appendix I : Repeated measures_Fixation_Travel	217
Appendix J : Posthoc paired test_Clicks and Task	225
Appendix K : Posthoc paired test_Fixations and Task	229
Appendix L : Repeated measures and Posthoc_Webpages	231
Appendix M : Regression_Food	240
Appendix N : Regression_Travel	241
Appendix O : Sobel Test	243
Appendix P : i) Univariate Analysis of Variance_Topical knowledge, task type Credibility_Food	244
Appendix P : ii) Univariate Analysis of Variance_Topical knowledge, task type Credibility_Food	245

LIST OF TABLES

Table 1. Theoretical framework	45
Table 2. An overview of research objectives	49
Table 3. Within- and Between-subjects experimental condition	60
Table 4. Dependent variables and Independent variables	66
Table 5. Sample metrics of fixation durations and counts within the AOIs	66
Table 6. Summary of the survey questions	69
Table 7. Brief interview questions	70
Table 8. An example of first cycle coding.....	73
Table 9. Descriptive statistics of hyperlink selections on travel and food blog sites	80
Table 10. Post hoc paired sampled test of hyperlinks – Clicks and Websites (within-subjects) and Task specificity (between-subjects)	81
Table 11. Summary – integrated quantitative and qualitative analysis	84
Table 12a. Descriptive statistics of number of webpages visited – Travel and Food websites	89
Table 12b. Post-hoc paired sampled test of number of webpages visited - Travel and Food websites and Task	90
Table 13a Descriptive statistics of fixation durations (sec) – Travel and Food websites	93
Table 13b. Post hoc paired sampled test of fixation durations – Fixations and Websites (within-subjects) and task specificity (between-subjects)	93
Table 14. Qualitative analysis of the influence of task specificity (specific and non-specific) On the information scent of links and cue	99

Table 15. An example of second-cycle coding of pattern codes	108
Table 16: Categorisations of strong and weak informational cues present in the Travel and Food blog websites	110
Table 17. Descriptive statistics of strong and weak informational cues	115
Table 18. Summary of Hierarchical Regression analysis for variables Predicting credibility evaluation	119
Table 19. ANOVA of topical knowledge and credibility perception.....	120
Table 20. Post-hoc simple effect test of topical knowledge and credibility assessment of Travel and Food websites	121
Table 21. Descriptive statistics of topical knowledge and task specificity in the credibility assessment of travel and food information search	122
Table 22. Summary of task specificity, topical knowledge and credibility assessments....	125
Table 23. Post-hoc simple effect test on level of difficulty and topical knowledge on credibility assessment – Travel website	126
Table 24. Post-hoc simple effect of level of difficulty and topical knowledge in credibility assessment – Food website	128
Table 25 Summary of key findings	136

LIST OF FIGURES

Figure 1.	Screenshot of a food weblog – an illustration of information scents of hyperlinks	2
Figure 2.	Snippets of texts, graphic or weblinks provide proximal cues to access distal content (Pirolli, Chen and Pitkow, 2003, p.2)	18
Figure 3a	Food website (partial webpage)	58
Figure 3b	Lonely Planet website (partial webpage)	58
Figure 4	Illustration of AOIs defined on a webpage	67
Figure 5:	Screenshot of mouse-click on ‘Read More’ link located below the food blog FB webpage (A) and <i>header link</i> of LP webpage (B) – partial webpages	78
Figure 6.	Hyperlink selections of the travel and food websites	82
Figure 7.	Hyperlink clicks by task specificity (Specific and Non-Specific tasks) – Travel and Food websites.....	88
Figure 8.	An example of a selected Areas of Interest (AOIs) of the travel website (partial webpage)	91
Figure 9.	Fixation durations of informational cues – Task specificity and websites.....	96
Figure 10.	(A) AOIs of advert and categories (LP)	98
	(B) AOIs of advert and categories (FB)	98
Figure 11.	Topical knowledge and task specificity in credibility evaluation – Food topic	123

Figure 12.	Topical knowledge and task specificity in credibility evaluation – Travel topic	124
Figure 13	Level of difficulty and topical knowledge in credibility evaluation – Travel topic	127
Figure 14.	Level of difficulty and topical knowledge in credibility evaluation – Food topic	127

ABSTRACT

Information seeking is an effortful task that involves user effort in filtering through hyperlinks and visual elements such as image and text. However, there is a lack of studies on the topic. This dissertation examines how hyperlink and visual elements and task specificity interacts to affect user effort during information seeking.

This research employs a mixed-method approach using an eye-tracking tool to analyse link-clicks and eye-fixations of hyperlinks and visual elements. In addition, post-experiment interviews and questionnaire surveys were administered to understand the individual's insights and meanings of their information behaviour. It is also to ensure a level of consistency accounting for the quantitative analysis.

The results showed that users incurred varied effort in engaging the hyperlinks. Hyperlinks play an important role in prompting users' action where they adopt the filtering techniques during information seeking. Furthermore, the findings revealed that task specificity interacts with effort and evaluation.

This research has shed light on the association of hyperlinks and visual element that reduce information seeking effort through aiding navigation, while the hyperlink aesthetic affects information evaluation. Task specificity interacts with hyperlink such that when task specificity is high, the effect of hyperlink aesthetics on effort is low.

The research contributes to guiding information provider and web designer to facilitate users' and consumers' information seeking in terms of the hyperlink structure and positioning of hyperlinks while accounting for task specificity.

CHAPTER 1

INTRODUCTION

Information seeking is an effortful task and users depend on search goals to use information (Ozmen, 2015). In particular, much effort is needed to filter through hyperlinks and visual elements to retrieve the needed information (Ozmen, 2015; Pirolli, Card and Van Der Wege, 2001). For example, an experiment conducted by Wise, Bolls and Schaefer (2008) showed that when users are exposed to a higher number of hyperlinks, they increase their effort in reading stories. Other research found that when the information retrieval system is easy, fast and convenient to find information, users expend less effort in information seeking (Cennamo, 1993; Krendi, 1986; Rieh, Kim and Markey, 2012; Salomon, 1984).

There has been a lack of studies on whether page elements such as hyperlinks and visual or text objects affect effort in web navigation. For example, when users search for information, they may look for clues in the hyperlinks to help with their search. Hyperlinks facilitate user effort in moving across webpages. According to McCart, Padmanabhan and Berndt (2013) clues from the hyperlinks convey to users about the content, and they increase visits to a website. However, our understanding of how hyperlinks and visual elements affect a user's mental effort and information judgement remain unclear.

Hyperlinks represent the interconnectivity of the webpages and are an essential tool for webpage navigation (Bar-Ilan, 2001; Yi and Jin, 2008). A previous study (Borah, 2014) found that individuals are willing to seek more information when news items are hyperlinked. Users are more motivated in the search with the display of hyperlinks (Wise, Bolls and Schaefer, 2008). Studies have also suggested correlations between links and its position on the webpage (Fu and Pirolli, 2007). However, it has not fully been addressed how the characteristics of hyperlinks affect user effort in navigation. Hasan (2016) suggested that visual elements such

as images affect a user's perception, motivation and attitudes in online shopping. There is also a lack of studies on the effect of image element on effort.

Figure 1 is an example of webpages showing hyperlinks and images on a food website. These hyperlinks direct users' attention and effort to connect them to navigate to other webpages. The hyperlink design determines the amount of effort required for a user to access the webpages (Vance, Elie-Dit-Cosaque, and Straub, 2008). While well-designed websites minimise user effort in their information search, poorly-designed websites require more effort, cognition and evoke negative emotions due to the difficulty in navigating the sites or finding information or product (Azeem, 2012; Chen & Wells, 1999; Gao & Wu, 2010).

Hyperlink on
message

Hyperlink on
image

Hyperlinks on
archived post
and product
categories

Figure 1 Screenshot of hyperlinks on a food website

Further, task factors can affect information seeking effort and yet studies are scant on this issue. Task characteristics such as specificity can increase the effort needed to complete a task. In line with this, prior studies has associated task and information search patterns and performance. Task has been shown to be one of the key variables that affect user effort (Wise, Bolls and Schaefer, 2008, Salomon, 1984). Other studies on task and information seeking suggested that task specificity may affect information user's search strategies and outcome (Xie, 2009). For instance, different search tasks such as informational searching, navigational searching or transactional searching require users to exert different degree of effort when engaging in a variety of information processing activities (Rose and Levinson, 2004).

Additionally, multiple sub-tasks stated in the task instructions produce some level of task difficulty (Albertson, 2010), that ranges from simple keyword search to problem-solving. Users who encounter task difficulty in an information search system tend to exert more effort in searching. Users expend less effort when the information retrieval system is easy and convenient to find information (Cennamo, 1992, 1993; Krendi, 1986, Rieh, Kim and Markey, 2012; Salomon, 1984, 1981).

Information seeking also requires informative evaluation. However, prior research in information evaluation has mostly focused on assessment of source cues. As explained in the preceding paragraphs, information seeking involves user mental effort and task characteristics. There is a lack of studies in understanding how task specificity and task difficulty affect information evaluation. Previous studies demonstrated that when users lack the ability to process information, they rely on credible source cues during information seeking. Thus, users incur less mental effort in assessing the characteristics of the content (Winter and Kramer, 2012). Information evaluation includes assessing the information provider, content and the website design (Choi and Stvilla, 2015; Fogg, 2003; Metzger, Flanagan, Eyal, Lemus, and McCann, 2003; Rieh and Danielson, 2007).

Against this background, based on the theories of information seeking, my research examines how hyperlink and task specificity interact to affect user effort.

The findings show that informative hyperlinks reduce information seeking effort through aiding navigation, while the aesthetics of hyperlinks affect information evaluation. Task specificity affects hyperlink interactions such that when task specificity is high, the effect of hyperlink on effort is low.

This study's findings suggest ways to design websites to facilitate users' and consumers' information seeking in terms of the hyperlink structure and positioning of hyperlinks while accounting for task specificity. A summary of the key findings is illustrated in Table 25.

Research Objectives

To address the lack of studies that examine hyperlink, information seeking effort, and interaction among other elements, the main objectives of this study are to:

- examine the roles of hyperlinks in affecting user effort in information seeking.

User effort is measured by link clicks and duration of fixations. This study is important to provide information providers and web designers the knowledge of creating a good website design for ease of user navigation and use of the website.

- investigate task specificity in affecting users' effort and evaluation.

Task specificity in this study includes *specifically-defined and non-specifically* defined task instructions, knowledge of search topic, and users' perceived level of task difficulty.

This research employs mixed methods with the use of an eye-tracking tool to analyse users' attention measured by link-clicks and eye-fixations of hyperlinks, and visual elements.

Research contributions

This research contributes to information seeking theory in understanding users' effort and task associated with hyperlinks and evaluation. The research contributes to:

- guiding policy makers and web designer to instil better informed online consumers by offering quality information and aesthetic of hyperlinks that minimise users' effort in information seeking.
- incorporating the factors of task specificity in examining the user effort and web navigation behaviour. Information seeking starts with a meeting an information need and purpose. This need arises from an information task which a user needs to complete.
- introducing a method of measuring users' effort through link-clicks by employing eye-tracking analysis. The eye-tracking method facilitates the generation of data on users'

gaze interactions or eye-fixations on the webpages. In the context of information seeking, the eye-fixations convey the attentional focus and effort on the part of the information seekers (Cutrell and Guan, 2007; Josephson and Holmes, 2002).

Structure of Thesis

The following chapters of this dissertation are organised as follows:

Chapter 1 introduces information seeking behaviour, task factors and credibility evaluations. The section highlights the gap in previous studies of information seeking behaviour in examining users' effort and information evaluation such as credibility assessment. The chapter ends with explanations of the research objectives and research contributions. Chapter 2 provides a detailed analysis of the literature review, research gap, and the significance of the study. The research questions and hypotheses are established in this section. Chapter 3 explains the research framework. Chapter 4 describes the research methodology, research design, procedures, and data collection. The experimental method, eye-tracking approach and interviews process are also explained. Chapter 5 discusses the findings based on the quantitative and qualitative analysis of the pilot study, the primary study of user effort, hyperlink, and task variables and topical knowledge of information credibility evaluations. Chapter 6 provides a general discussion. This is followed by Chapter 7 which provides a conclusion to the research including contributions and limitations of the study.

Chapter summary

This introductory chapter has provided an overview on information seeking behaviour, specifically in the roles of hyperlinks and task specificity that may influence users' mental effort. The section identifies the current research gaps. It also gave an outline of the research objectives and contributions for this study.

CHAPTER 2

LITERATURE REVIEW

Information seeking is fluid and open-ended in nature. Information seeking behaviour depicts a user's active action in optimising the value of assessing and collecting information resources during web navigation. Understanding the insights into the user effort and evaluation of information content in handling information overload is important (Sundar, Knobloch-Westerwick and Hastall, 2007). This is because users are subjected to the intrinsic factors such as skills and knowledge and the extrinsic factors of the availability of external resources (Dwairy, Dowell and Stahl, 2011).

In the online environments, information cues from hyperlinks, visual, animated and textual contents are the elements of the webpages on the websites. Web navigation is made possible with hyperlinks that connect webpages. In navigating the myriad of webpages to meet a search task goal, users rely on information cues to maximise their search which facilitate information evaluation. The hyperlinks and content produce an information cue, which influences users' assessment of the source of information (Pirolli, 2007). Conversely, a user makes decision whether to continue or navigate to another webpage (Tomasi, 2014). Sundar, Knobloch-Westerwick and Hastall (2007) proposed that the hyperlinks are 'psychologically' significant and worthy of design attention (p. 377). However, it was not clear if hyperlinks affect user effort in web navigation.

Information seeking hinges on the user's need to meet his or her information purpose, when the information seeker is faced with a task to be performed (Derr, 1983). Various scholars have contended that information seeking is guided by task (Kuhlthau, 1993; Bystrom and Jarvelin, 1995; Wilson, 1997; Tesser, 2002; Savolainen, 2012(b); Wildermuth, Freund and Toms, 2014) where task instructions are embedded within the information seeking context.

The goal-oriented search takes place through the stages of task initiation, exploration, and the formulation of search queries which culminates in closure for the search (Kuhlthau, 2004). The characteristics of task include task specificity, task difficulty or knowledge of the topic which Tesser (2002) explained that information task of lower priority decreases the need for absorbing information. Other studies found that task type impacts gaze interactions, navigation and task completion time (Lorigo, Pan, Hembrooke, Joachims, Granka and Gay, 2006). Hence, in studying human information behaviour, it is imperative to examine user task-orientation (Wilson, 2000). During information seeking an individual's attentional focus that denotes effort expended, and engagement of information cues require a certain level of information judgement.

Evaluating information entails the examination and appraisal of the quality of the source and its content. Information seekers align quality of content relating to its credibility to guide their information processing. For example, they may discontinue information search due to the perceived unfavourable quality of content, and the irrelevance of the information in relation to their search. Hasan (2016) suggested that poor, content, navigational, and website designs lead to irritation in online users. This irritation has a negative impact on the perception of sources' credibility and integrity (Gao and Wu, 2010).

Furthermore, the judgement of the information cues lies in users' knowledge of the topic, instructions of the task, level of difficulty of the information task and the perception of quality and credibility of the source and content. Various studies advocated that topical knowledge affects search moves (Marchionini, Meadow, Dwiggins, Liu, Wang, and Yuan, 1991; Shiri and Revie, 2003), task performance (Liu and Belkin, 2014) and information evaluation (Pennanen and Vakkari, 2002).

Against this background, this research examines the user effort in engaging the hyperlinks and non-hyperlinked elements. It is important to consider the variables of task in

affecting user's evaluation of a particular website. These variables are incorporated in the research questions.

This chapter discusses the review of literature on the concepts of information seeking behaviour, the role of task variables and its influence on information retrieval and cognitive processing behaviour. The section continues with a discussion on information seeking theory, highlighting the notions of hyperlink, information cues and evaluation of websites. The review of literature is followed by exploring the theoretical perspectives of topical knowledge and credibility judgements. The literature contributes to a better understanding of the relationship between the user effort and task in hyperlink interactions and information evaluation.

Information behaviour

Traditionally, information seeking behaviour in the field of library and information science research mainly focused on human active search for information and documents in the library. Information search activity involves information seeking and retrieval, information foraging, organizing and the use of information (Spink and Cole, 2004). With the advancement of the Internet technologies, researchers had integrated problem solving with information foraging approaches in the study of information behaviour (Pirolli and Card, 1995; Spink and Cole, 2006 and Wilson, 1999). The Internet is conceived as a space or place as analogous to the physical library or printed encyclopaedia (Savolainen and Kari, 2004). Information seeking behaviour exhibited in the physical environments of work or school, and online environments such as the information system or the Internet is similar. In these environments, individuals access a variety of information sources to meet their information needs or solve an information problem.

Information behaviour encompass active and passive information seeking and information use, include the totality of human behaviour related to sources and channels of

information (Wilson, 2000). Burnett and Jaeger (2011) postulated that information behaviour is entrenched in multiple contextual layers. Individuals seek information to fill persistent gaps in the world and reduce uncertainty about the state of an event. Dervin's (1983) sense-making concept, which is about fulfilling an information need, postulated that four key elements emerge in information behaviour. They are: *situation* (contexts of time and space); *gap* (uncertainty); *outcome* (results of the sense-making process); *bridge* (close the gap between situation and outcome). In addition, Dervin's "assumption of discontinuity" suggests that information seekers may turn to source expertise to meet their information need (2003a; 2003b). To bridge the perception of the "assumption of discontinuity" and to reduce uncertainty regarding information need, information seekers may turn to information specialists or source expertise. Conversely, they may spread or share information (Wilson 1999), dispute or disbelieve information (Chatman, 1999), avoid or ignore information (Chatman 1996, 2000; Wilson 1997).

According to Case (2012), some pertinent concepts of information seeking that warrant attention are decision making, relevance, selective exposure browsing, serendipity, knowledge gaps, information poverty, information overload, information avoidance, information anxiety, collaborative information sharing (p.95). As a consequence, their existing state of information seeking and knowledge accumulation can be altered (Belkin, 1990). The features of the information seeking process are activities between micro-analysis and macro-analysis of search behaviour (Ellis, 1989; Ellis, Cox and Hall, 1993). As Ellis, Cox and Hall (1993) put forth, they involve the following:

Starting: the means employed by the user to begin seeking information

Chaining: following footnotes and citations in known material or 'forward' chaining from known items through citation indexes;

Browsing: 'semi-directed or semi-structured search'

Differentiating: using known differences in information sources as a way of filtering the amount of information obtained;

Monitoring: keeping up-to-date or current awareness searching;

Extracting: selectively identifying relevant material in an information source;

Verifying: checking the accuracy of information;

Ending: defined as ‘tying up loose ends’ through a final search (p. 359).

As Ellis (1989) explained, the information seeking activities are interconnected but not necessarily occur in sequential patterns. They can be employed in the information retrieval system on a physical document or in the “computer-based retrieval system” (p.192). Information seekers typically start with a key reference (keyword) or key paper (title) to begin the search. Browsing involves the scanning of current content or the examination of books. The browsing activity, as Ellis maintained, may then progress to chaining through “citation connections between material” (p.183). Conversely, users may identify sources of document by differentiating between them. They may complement their filtering activities with monitoring sources. For example, in human-computer interactions, the differentiation of materials could be filtered according to quality, reputation or prestige, and the level based on each topic. In extracting material, users employ a systematic structure to selectively locate items of interest from a source. Ellis expanded his study to include the verifying and ending stages (Ellis, Cox, and Hall 1993). Verifying denotes evaluating the information to ascertain its accuracy and quality. Ending activities represents a closure to the information seeking process when a search task is completed. At the ending stage of an information search, to answer any unresolved questions or to clarify them, users may conduct another search on a smaller scale (Ellis and Haugan, 1997).

Kuhlthau (2004)'s model of information search process extends the information seeking dimension by addressing the barriers of information uncertainty through six stages of information seeking activities. These involve task initiation, topic selection, pre-focus exploration, formulation, information collection, and search closure. Additionally, Kuhlthau (1993) suggested that in performing a task, users employed varied strategies and express different information behaviour in the different stages of information seeking process. This process has resonated with Case (2002) and Marchionini (1995) in relation to the problem-solving framework and goal-directed behaviour in information behaviour studies. To counter the pervasiveness of available information in the web environments, users adapt their cognitive processing and effort to decipher the quality, usefulness and relevancy of the resources to meet their information need. Information retrieval encompasses complex cognitive activities that requires "problem solving, decision making and text comprehension processes" (Monchaux, Amadieu, Chevalier, Marine, 2015, p.2). These authors also highlighted that information seekers adopt three stages of information searching that involve various stages of planning and formulating a query, evaluating and selecting the information provided by the search engine, and processing information (Sharit, Hernandez, Czaja, and Pirolli, 2008). Specifically, information seeking does not operate in a vacuum. It is complex as cognitive processing activities require users to employ strategies and tactics in the formulation of search queries, thus enabling efficient navigation within the webpages, and the accurate evaluation of information. The strategic effort in information seeking are related to the foraging attitude of users in attempting to optimise the search process and its outcome.

Information seeking

Information seeking that include foraging activities are "associated with assessing, seeking, and handling information sources" (Pirolli and Card, 1995, p. 2). Foraging for

information is based on the assumption that people develop strategies that optimize the use of information to minimise the cost of interaction during information seeking (Fu and Pirolli, 2007). Information foraging theory draws on the analogy of organisms' foraging behaviour in the ecological environment (Pirolli and Card, 1997; 1999). In the web environment, this implies that information seeking is not any different from the ecological environment. People are "informavores" where they ingurgitate information the same way animals devour food (Pirolli and Card, 2001). The animals face a variety of challenges while foraging for food and prey, so they seek an environment (patch) that grant them with payoff from the foraging options of food source. The foraging result is considered successful if it optimises value by embarking on strategies from various alternative choices. For instance, the animals will move on to another patch when the current environment the organisms are situated are no longer viable for them to forage, so leaving the environment is more conducive than staying in it. Thus, the foraging analogy of animals/organisms is similar to users/people when the online environment no longer serves a purpose. In other words, users will exert less effort and leave the online environment when there are no more gains for them there.

Information search on the internet is characterised by a user's goals and objectives (Huges, Wareham and Joshi, 2010; Jansen, Booth, and Spink, 2008; Rose and Levinson, 2004). These goals may be navigational (to reach a website), informational, or transactional (to purchase products, or service). Conversely, in the information retrieval process, users' information searches are subjected to the optimal use of knowledge about expected information value and expected costs of accessing and extracting the relevant information (Pirolli and Card, 1995, p. 2). Information seekers prefer their information retrieval to be speedy and convenient (Markey, 2007, Rieh, Kim and Markey, 2012). "Cost" refers to the individual's effort of accessing, rendering, and interpreting informational resources during information gathering (Pirolli and Card, 1995; 1999).

Optimal foraging behaviour (Stephens and Krebs, 1986) lies in the environmental influence on the response behaviour of the organisms. In the context information foraging, optimal foraging behaviour occurs when information seekers choose between sets of alternative decisions which follow a sequence of discrete behavioural steps in determining the location to forage and which information prey to pursue. To maximize the value of information and knowledge gained from searching information on the web, information seekers tend to weigh the value and costs of information foraging. Thus, they are required to choose between which links to follow based on available information or technological cues and when to give up searching for information on the current webpage and navigate to another site (Pirolli, 2005). Hence at each step of search, the information seeker is faced with decisions where choices may be constrained by intrinsic skills of foraging and/or extrinsic influences of constraints of time availability and resource distribution (Dwairy, Dowell and Stahl, 2011). Intrinsic skills encompass information literacy and search skills, and extrinsic factors involve quality and accurate information.

The cognitive models of information retrieval or search on the Internet, focusing on search strategy examine how “moves” link with cognitive patterns of search behaviour (e.g. Navarro-Prieto et al., 1999; Thatcher, 2008, Pirolli, 2007). Ford (2005, p.2) defines the cognitive aspects of information retrieval as the “development, use and evaluation of information behaviour support systems that explicitly engaged the mental process.” Extensive literature from these authors (Huges, Wareham and Joshi, 2010) who have examined behavioural models suggested that “different moves or tactics during Internet search termed as cognitive models, that include decision making or strategies.” (p.1). Thatcher (2006) draws attention to the internalised, automatic and unconscious interactions for all information seeking tasks as a pattern of information seeking. Marchionini (1995) identified the patterns and behaviours of the Web users’ information seeking as: moves, tactics, strategies, and

patterns. For example, moves are single behavioural actions that characterise users clicking on a hyperlink, conducting a query using a search engine, and/or using the “back” button (Thatcher, 2006). Tactics refer to groups of behaviours. For example, users may type a search query using general search terms and subsequently narrow the search domain by using specific query terms. Strategies involve applying a specific search strategy to a particular information seeking goal, e.g. a user selectively chooses a search engine for query. These search strategies conducted were mostly linked to the Web users’ experience and comparisons were made between novice and expert users in information seeking (e.g Lazonder, Biemans and Wopereis, 2000; Thatcher, 2008). The web environment allows users to conduct an effective search or employ information seeking tactics through the accessibility tools such as search engines, hyperlinks and other visual elements.

Websites as information patches

Patches mark an important element of the information foraging theory whereby organisms hunt for prey in identified territories (Pirolli and Card, 1999). In the ecological environment, animals attempt to weigh the cost-benefit approach in determining whether to continue foraging in the patch or forgo that by searching for a new path. In the case of people, information foraging theory suggests that during a foraging activity, they adapt best to the environment and vice versa. Pirolli and Card defines this process of “moulding the environment to fit the available strategies” (p.4) as environment enrichment. Firstly, environment enrichment prompts the information seekers to modify the environment in order to minimize the cost of navigating between webpages. Secondly, environment enrichment allows the information seekers to yield better returns of valuable information on the information environment. On the Internet, an information seeker may refine keyword queries using search engines to generate a higher proportion of relevant document citations while another may enrich his/her information seeking by filtering information sources. Conversely,

the selection of hyperlinks for the purpose of searching for more information and the evaluation of source and information resources both contribute to the process of environment enrichment. The outcome of the enrichment activities increases the rate of retrieving relevant information which yields a total time cost reduction (Pirolli and Card, 1999).

In the information environments, webpages are considered “information patch”, an interactive and collaborative comprising the hypermedia and hypertext documents linked to one another (Catledge and Pitkow, 1995; Lazonder, Biemans, and Wopereis, 2000). The website expresses the level of structure. The visual elements such as hyperlinks and other visual objects potentially determine the attention focus and effort (Katz and Byrne, 2002) of the information seekers. A small web page characterises the structure of a lower level of structure while a major website constitutes a higher -level structure (Khapre and Saleembasha, 2012). The brightness or colour of the visual display, coupled with objects that lie within visual boundaries capture attention (Todd and Kramer, 1993). Users seek a payout from information seeking. They discern the value and cost of the website by scanning content, in which it transmits an information cue (Olston and Chi, 2003). If users are satisfied with the salience of their search results, they are deemed to be “sticky” with the users (Kalyanaraman and Ivory, 2009).

Weblogs create “diminished boundaries between private and public.” (Bimber, Flanagin and Stohl, 2005, p. 381). The creation of informational resources such as thoughts, knowledge, events, photographs bridge the boundaries between bloggers and information recipients. Moreover, the linkage mechanisms of information and communication ease transitions of both public goods and non-public goods (Bimber, Flanagin and Stohl, 2005). Several researchers have studied the flow of information within the bloggers’ community with respect to online social networks (Adar and Adamic, 2005; Adar, Adamic, Zhang, and Lukose, 2004; Park and Thelwall, 2009; Schmidt, 2007; and Weng, Ratkeiwiez, Perra, Perra, Goncalves, Bonchi,

Schifanella, Menczer and Flammini, Castillo, 2013). Individuals' information retrieval does not occur in a vacuum, nor is it insulated from the social environment. The study of physical workspaces and information environment like the layout of work documents reveal minimization of information seeking costs (Pirolli and Card, 1999). In their study, the participants' information seeking activities are prompted by the identification of categories while scanning the materials. What differentiates the web in the surrounding information environment from other traditional media is the user's ability to link pages, sites, and documents (Napoli, 2008). McCart, Pandmanabhan and Berndt (2013) suggested that future studies about information foraging would benefit by integrating memory with foraging decisions and operationalizing information patches which include webpages. Hence the current study examines user effort in hyperlink in information seeking.

Hyperlinks and information cues

Hyperlinks and other visual elements (images, text) are information cues that play a pivotal role in connecting information sources and users through information spaces. Researchers investigating information behaviour referred to the online environmental cues as: proximal cues (Pirolli, 1997; Pirolli, 2003); visual cues (Tomasi, 2014); source cues (Winter and Kramer, 2012); informational cues (Lee and Pang, 2014). Proximal cues are snippets or graphics in the immediate environment that transmit a scent, and they draw the attention of the information seekers which cause them to navigate to a particular source or webpage. These proximal cues enable information users to judge the value or relevance of the distal content which is the page at the other end of the link (Pirolli, 1997). For an illustration of the proximal cues, see Figure 2. Other intrinsic cues such as source expertise guide users' specific searches on a relevant topic (Petty and Cacioppo, 1986). Expertise cues relates to the profession and status of the author of a blogpost that influences the perception of credibility of the source. Burgoon and Saine (1978) identified chronemic or temporal cues as part of a

non-verbal cue system which shapes the perception of individuals. Information cues that are perceived as threats are negatively reflected. For example, a pop-up advertisement is a negative cue (Dailey, 2004; Brehm and Brehm, 1981) as it elicits a weak information cue for the users.

Figure 2 *Snippets of texts, graphic or weblinks provide proximal cues to access distal content. (Pirolli, Chen and Pitkow, 2003, p. 2)*

The ubiquitous web environment inundated with a repository of information requires discerning online users to make selective information decisions. Information seekers often rely on the online hyperlinks to help them navigate the web environment.

Information cues leave an overt or a covert trail and produce an information clue that guides information searching and processing. The analogy was suggested by Pirolli and Card (1999) about the way organisms hunt for food prey in various patches is akin to a human's information retrieval behaviour in the web environment. The salient characteristics rest on the users' strategies and techniques to maximize the costs and rewards, among the various alternatives and options available within the information environments (Stephens and Krebs, 1986). Central to the theory of information foraging is the perceived appeal of the information patch (Pirolli and Card, 1999; Blackmon, 2012). Card, Pirolli and Van Der Wege (2001) suggested that information cue may be "delivered by link descriptors, images, contextual clues, for example, headings or page layout" (p.2). When users forage for information, they may traverse between webpages by clicking on an image or a textual link to view further information or move to other webpage, if the current site is scarce with relevant content.

McCart, Padmanabhan and Berndt (2013) postulated that clues from the hyperlinks are the driving force that entice individuals in their navigation decisions. Their study on hyperlinks and task variable on the long tail websites, which are websites that receive a number of visits, suggested that the user is capable of evaluating the hyperlinks when the task descriptions are well-defined.

Pirolli (2007) further explained information cues from the text and images attached with hyperlinks convey information about distal content (McCart, Padmanabhan and Berndt, 2013). Hyperlinks represents the interconnectivity of the webpages and are an essential tool for webpages navigation (Bar-Ilan, 2001; Yi and Jin, 2008). Hyperlink analysis is commonly measured by link counts that signifies a collection of web pages and content analysis (Yi and Jin, 2008; Bar-Ilan, 2001). Conversely, the activation of links is the manifestation of their relative cues (McCart, Pandmanabhan and Berndt, 2013).

Users may perceive the hyperlink as a “strong scent, weak scent, or no scent” (Sundar, Knobloch-Westerwick, and Hastall, 2007:1), as they shape their judgement and processing of information. A website with strong cues determine users’ attribution of the popularity and credibility of the source and the objectivity of reviewers (Sundar, 1999), including text and images, captions and hyperlinks. Sandstrom (2001) highlighted that these paths optimally assist online users in their search for easy retrieval of information. Previous research on source cues (Winter and Kramer, 2012) showed that the user-generated content and the expertise of the author of a blog post affect the perception of source credibility. This information judgement, amid covertly, possesses a strong cue. Other studies (Schamber, Eisenberg and Nilan, 1990; Tombros, Ruthven and Jose, 2005) suggested that users’ appraisal of information quality and value is associated significantly with cues such as the objective reviews, authorship or up-to-date information.

On the contrary, weak information cues such as a lack of popularity, absence of reviewers' comments, poor use of language, unprofessional pixelated images may lead users to accord a low level of credibility of the website. Some hyperlinks may be viewed as threats and elicit negative reactions such as frustration, anger and hostility (Dailey, 2004; Brehm and Brehm, 1981). In optimising one's decision during information seeking, an individual may decide to leave the less sticky and site with weak cue.

User effort in information seeking

Information users usually organise and categorise information that enable them to maximise the use of information resources. According to Bates (1989), 'berry picking' is a selective approach throughout the information search process (Ingwersen and Jarvelin, 2005). For example, users may potentially adjust their information seeking behaviour in attributing the external information when they encounter a task or a problematic situation (Borlund and Dreier, 2014). This information seeking process results in individual sieving out information cues that are not relevant to the search task (Pirolli and Card, 1999). The scanning or filtering behaviour imply an effortful approach in minimising effort during information seeking. In this way, users optimise their time in information search and efficiently complete their task.

During information seeking, the investment of time and effort is critical in meeting information search tasks productively. When there is no pressure from time constraints, people rely on their preferences to make decisions (Amichai-Hamburger, 2002). In terms of time constraints, an individual may lean on familiar sources rather than unfamiliar ones, as an example of weighing the costs and benefits, during an information search (Kari and Savolainen, 2004). Significant findings have been reported in ocular behaviour such as fixations, saccades, and scan paths (Granka, Joachims and Gay, 2004 and Rayner, 1998) in expending mental effort. In an eye tracking study, Granka, Joachims and Gay (2004) showed users' link-click behaviour and length of fixations on the ranked results of abstracts on search

engine. The subjects were each given ten questions on homepage-searches and informational searches with varying degrees of difficulty. The findings by Granka, Joachims and Gay (2004) demonstrated that although the time for link clicks on ranks 1 and 2 were equal, fixation time was reduced after the second link. The result illustrated the visibility of the common 5 to 6 links without a user scrolling. Users' information scanning behaviour were demonstrated in their low link-clicks beyond rank 1. Other study (Nicholar, Huntinghon, Jamali and Dobrowolski, 2007) on user effort on webpages and return visits, for instance site penetration, found that the majority of users viewed only a few items on the webpage during a visit to the website. Two-thirds of the sample viewed three items or less before exiting the page (Nicholar, Huntinghon, Jamali and Dobrowolski, 2007). Research by Lindgaard, Fernandes, Dudek and Brown (2006) showed that people typically take 50 milliseconds to make information decisions about a webpage they visit. Also, Johnson, Bellman, and Lohse (2003) conducted a study on website visit durations which indicated that visitors tended to spend less time on the webpage as they traverse to more sites. Other researchers (Duggan and Payne, 2009; Lowrance and Moulaison, 2014) found that due to time constraints, users skimmed through the visual and text objects during information retrieval.

Wittek, Liu, Daranyi, Gedeon and Ik (2016)'s research on the information behaviour of biomedical search, based on data generated from the eye-infrared camera and eye-tracking tool, indicated that users expended less mental effort when the search task was difficult. The result implied that users conducted a limited search in attending to all content elements. From the selected area of interest (AOI) in subject headings, title, authors and abstract, the outcome showed that when users formulated more queries, the fixations on the subject headings were high, but less attention was paid to the abstract. The eye-gaze data demonstrated that users who engaged in more mouse-clicks paid less interest in the titles.

Studies on information seeking behaviour (Schamber et al, 1990; Sundar, Knoblock-Westerwick and Hastall, 2007) have investigated users' navigation behaviour of switching from webpages to webpages. Wittek, Liu, Daranyi, Gedeon and Lim (2016) suggested that users employ the cost-value assessment when navigating from one site to another. Information visualisation research by Pirolli, Card and Van Der Wege (2001), based on the Hyperbolic browser which 'display large hierarchical tree structures' (p. 3), suggested that focus and different information cues have implications on information seeking. These researchers posit that the density of information within the boundaries of the useful field of view garnered higher information processing and attention than information displayed outside the area (Pirolli, Card and Van Der Wege, 2001). In their eye-tracking experiment with Hyperbolic and Explorer browsers, results showed that a low information cue transmitted from the Hyperbolic browser, the number of fixations was higher compared to Explorer browsers. The speed of retrieval was faster in both browsers when the information cue is strong. When the aesthetic of the hyperlinks is weak, the user's visual search appeared to be difficult. Results suggested that significant interaction of browsers and information cues affect task completion time and information retrieval.

According to the concept of amount of invested mental effort (Saloman, 1981) of online information search (Cennamo, 1992, 1993; Krendi, 1986, Rieh, Kim and Markey, 2012; Salomon, 1984, 1981), users would expend little mental effort in the search when the information retrieval system is easy. When they encounter difficulty in the demand of the system (Salomon, 1984) they would invest more effort. The variables that may affect the invested effort may come from stimulus, task or context. (Salomon, 1984). With regard to the stimulus and context, in an experimental study conducted by Wise, Bolls and Schaefer (2008), they found that when individuals were exposed to a higher number of hyperlinks, they demonstrated an increase in mental effort while reading stories. This effort exerted is

determinant on users' interactions with hyperlinks, and that influence individuals' comprehension of a news story (Borah, 2014). Rieh, Kim and Markey (2012)'s study on the information searching online had measured the users' mental effort by assessing the time completion of the task, the number of clicks and number of actions taken by the respondents.

Although these studies have examined the hyperlinks and mental effort in reading comprehension and on information search systems, there was scant research on how hyperlinks and cues influence user effort in information seeking and navigation across the webpages. It is an important study for the information provider and web designer to understand how users make decision to select and evaluate these links to ease their search and navigation on the websites.

In this study, user effort in interacting with the hyperlinks is measured by the link-click counts. User effort in engaging the visual elements is assessed through the fixation durations. A follow-up qualitative inquiry through interviews to determine users' link-clicks and fixations interpretations were conducted to find out their attentional focus, effort and information evaluation.

Hence, the first research question aims to examine the influence of hyperlinks in influencing user effort in information seeking.

RQ1 : How do hyperlinks affect users' effort in information seeking?

Task factors

Kuhlthau (1993) first introduced the information search process model that incorporated learning tasks' influence on information searching and acquisition. The author suggested the stages of task search starting from users' initiation, selection, exploration, formulation, collect, to presentation in which the model depicted the contextual factors of task impact on information searching. The studies demonstrated that when an individual is focused on a task,

he or she is able to articulate their information need and conduct more directed information searches (Jarvelin, Vakkari, Arvola, Baskaya, Jarvelin, Kekalainen, Keskustalo, Kumpulainen, Saastamoinen, Savolainen and Sormunen, 2015).

Individuals do not usually perform a thorough search in all the accessible alternative paths due to the limitation of human information processing resources. Rather, they rely on mental shortcuts or heuristics to fulfil their information goal through the engagement of the visual cues from the display and semantic cues from the text or words on the page (Budiou and Pirolli, 2007). Contextual factors such as situational, social, and task-related factors influence the cognitive and affective motivational attributes to information seeking and uncertainty (Allen, 1997; Savolainen, 2012a).

Situational context refers to the urgency or time frame of a task (Bystrom and Jarvelin, 1995). The social context may be found in the social norms and roles as perceived by the online community or organisation (Sundin and Johannison, 2005). Task-related factor refers to the work role of the actor (Wilson, 1997; Savolainen, 2012a). The immediacy (e.g. timing) in the information seeking activity, as well as the wider environment present many barriers during information process (Wilson, 1997). A study conducted by Reader and Payne (2007) on online information retrieval and web browsing demonstrated that online users are adaptive in allocating their time in information-rich environments (e.g. Pirolli and Card, 1999; Card, Pirolli, Van Der Wege, Morrison, Reeder, Schraedley and Boshart, 2001). For instance, the subjects in these studies have tended to engage in a series of filtering activities, use of Web links to assess distal content and allocate attention to the text triggered by the information cue. Evidence from an experimental study (Reader and Payne, 2007) showed that sampling strategy and satisficing strategy emerge as foraging techniques in evaluating and studying texts. This phenomenon is analogous to the relationship between exploring and exploiting food patches from a foraging perspective (p. 290). Similarly, Dwairy, Dowell and Stahl (2011)

conducted research on information search based on information foraging activities by medical practitioners, by examining the sequence and steps they deployed for their decision-making processes. Evidence in their findings showed that under time constraints, the medical practitioners optimize information search by minimizing the time in information seeking and maximizing the possible benefits gained through the reliability of electronic sources, and consulting colleagues in the offline context.

Wilson (2000) suggested that in examining human information behaviour, in addition to understanding an individual's or organisation's information needs, it is equally important to study information seeking behaviour in relation to the task-oriented behaviour. Researchers have classified task as involving task goals or sub-goals which are intentions (Belkin, Chang, Downs, Saracevic and Zhao, 1990). They consist of general or a specific set of actions in information seeking related activities (Bystrom and Hansen, 2005). Other attributes of task include task type, task goal (e.g. content) and task structure or component (Wildermuth, Freund, and Toms, 2014). Wildermuth and his colleagues further categorised task attributes into task complexity and task difficulty in their study.

Task is typically action-based that incurs physical, affective, and cognitive levels in the search goal (Savolainen and Kari, 2004). Rose and Levinson (2004) included task sub-goals as information, transactional and navigational, which signify the interactive intentions in locating information (Xie, 2009). Assigned search task contains written description of the topic and search goal or purpose of the search (Kelly, 2009). The task-related factors of information retrieval are contingent on information search goal or intent. Task is defined as a performance of activity and consists of a series of actions to pursue a goal (Hackos and Redish, 1998, Handsen, 1999; Vikkari, 2005). As performing a task involves physical and cognitive actions (Vikkari, 2005), it is vital to consider the task variables and task problems (Ingwersen, 1992) in information seeking studies. Search tasks influence users' information

retrieval experience and searching behaviour (Li, 2009). Past researchers had studied the association of the individual's mental models and search task performance and found the mental effort influence information seeking behaviour relating to query constructions, navigational and search patterns (e.g. Borgman, 1986; Halasz and Moran, 1983; Zhang, 2008). Zhang (2012) conducted a study on the impact of tasks on the subjects' mental models of MedlinePlus, a governmental health information platform. The researcher administered a simple task involving questions and answers with less ambiguity and a complex task comprising research questions, which were indicative of an exploratory search. Zhang's findings demonstrated that the two task groups differ in the heuristic evaluations of the MedlinePlus system and strategies when using the health information portal. The simple task group constructed the heuristics in less cognitively demanding activities, e.g. using information the system, while the complex task group developed heuristics of a higher cognitively demanding activities such as processing and evaluating information.

The specificity and complexity of the task affect the search performance (Saracevic and Kantor, 1988). Various researchers have attempted to identify categories for various types of tasks (Lazonder, 2000; Lazonder, Biemans, and Wopereis, 2000; Navarro-Prieto, Scaife, and Rogers, 1999; Madden, Ford, Miller and Levy, 2006). For example, in the offline context, information needs are aligned to the purpose of the task and are categorised by domain information, problem information and problem-solving information (Barr and Feigenbaum, 1981; Bystrom and Jarvelin, 1994). Based on a study (Lazonder et al, 2000) on users' search techniques in relation to the site-location and information-location task on Web search, the result indicated the search strategies adopted by the experienced subjects relied on "searched" rather than "browsed" to meet the task of site-location (p. 5). According to Rose and Levinson (2004), information search intents are categorised under three search activities. Informational searching involves content search to address an information need, for example, data, text,

documents, and multimedia. Navigational search relates to users locating a particular website, webpage or hub. Transactional search refers to users identifying a website to search for a product or service information, for example, to purchase a product, administer an online application, or download multimedia. This search may require users to engage the Web service or features of a particular website.

Within this task-related goal, an individual's information retrieval on the Internet is determined by the users' characteristics such as web search experience (Thatcher, 2008), mental model (Borgman, 1986; Kim and Hirtle, 1995), topical knowledge, and salient factors that influence user's cognitive search strategy (Navarro_Prieto, Scaife and Rogers, 1999; Huges, Wareham and Joshi, 2010). In a psychological study of physical work task activity, task difficulty or complexity has an influential effect on performance (Locke, Shaw, Saari and Latham, 1981; Wood, Mento and Locke, 1987). These studies on specificity of task and on an individual's topical knowledge are useful for understanding human information seeking behaviour.

Search strategy choice is influenced by the type of search task (Navarro-Prieto, 1999; Thatcher, 2007) and user effort. Mental effort in information retrieval is determined by a user effort (Belkin and Muresan, 2004). Previous research had integrated task attributes to search patterns (e.g. Toms, Villa and McCay-Peet, 2013) to examine users' time and effort in responding to information task, efficiency of the search and cognitive abilities (Kim and Allen, 2002). According to the information foraging theory, information cues drive information processing behaviour and web navigation (Pirolli, 2005). However, due to the human's satisficing behaviour in applying heuristic (short-cut judgement) information decision-making and problem-solving, it would be useful to understand the cognitive thought and 'embedding task environment' (Pirolli and Card, 1999) that motivate users investing of effort and evaluations of the information cues. For instance, information seekers often leverage on

their previous search experience and knowledge, motivations, task-orientation and external elements in retrieving, processing and judging information.

The study by Rieh, Kim and Markey (2012) using dual-task method to examine user effort in information search on the library system and web search on one hand revealed that users tended to exert more effort when they perceived the demand of the task to be difficult regardless of the type of search system. On the other hand, the subjects invested in less effort when they possess search ability and web search easiness. Flad (2002)'s study used visual stimulus in information search to assess task difficulty and mental effort. The result reported that when subjects encountered difficult task, they expended more mental effort in the search.

Hence, the second research question aims to address:

RQ2 : How does task specificity affect users' effort in information seeking?

In this study, sub-tasks were included in the task to build some level of complexity within each task type which is characterised as *specifically-defined instructions or specific task*. In *non-specifically defined instructions or non-specific task*, the task descriptions consist of general search instructions. For example, for one of the *specifically-defined* task on food search information, instructions consist of specific sub-task descriptions such as one seafood and one vegetarian restaurant in the east and west zone. For non-specifically defined task, general instructions include asking participants to search for information on the websites about popular restaurants or cuisines in Singapore.

Credibility and website evaluation

Users' appraisal of credibility on the trustworthiness and reliability of sources, and the quality content on the website are vital in boosting users' confidence and garnering positive emotion during their information retrieval (Robins and Holmes, 2008).

Information or content featured in the web environments may seem to hold relevance to task instructions, but users may not perceive the quality of the information as credible. Relevance denotes searched information which matches the users' expectation (Kalyanaraman and Ivory, 2009). Although relevancy assessment has been considered an important consideration in information retrieval (Borlund, 2003; Mizzaro, 1998; Wilson, 1973), researchers (Karlgrén and Hansen, 2003; Kekaiainen and Jarvelin, 2002; Borlund and Ingwersen, 1997; Saracevic, 1996) suggested a need to relook and elaborate beyond the traditional forms of information assessment. As information search involves the interaction between information seekers and the source of the website and channel, information seeking activities include users' adopting techniques, such as navigating and browsing content formulating and reformulating query, and the examination of the source and content. Studies on how users rely on proximal cues to solve an information overload problem (Bystrom and Hansen, 2005; Sundar, Knobloch-Westerwick and Hastall, 2007) demonstrated that the perception of credibility of the source overrides the recency cue (updated information) and content relevancy in ascertaining message credibility. Researchers (Liu, 2004; Lynch, 2001) have emphasised integrating credibility such as trust and source attribution with information seeking behaviour.

In the everyday information seeking in the online environments, users base their perception on cognitive, affective and situational factors, such as perceived accuracy, quality and reliability of sources and channels which influence their information behaviour (Savolainen and Kari, 2004). The responses elicited from Savolainen and Kari's qualitative research demonstrated that users' conception of networked sources in online search placed emphasis on the quality or reliability. Lucassen and Schraagen (2012) suggested information seekers may lack the expertise to decipher credibility of the content if information is new to them. In the context of this evaluation deficiency, an individual tends to assess surface cues

as heuristic information processing. Wittek, Liu, Daranyi, Gedeon and Lim (2016) agreed that due to the uncertainty and the users' incomplete knowledge of the information environment, the consequential decisions revert to perceptual and investigative approaches to guide information searching and foraging.

Informational seeking activities entail the engagement of an individual's cognitive thought process through the assessment, adaptation, and interpretation of information (Pirolli and Card, 1995, 1999). Users assess their effort stay or move to different webpages based on perceived trust and quality of the information and site. The process of discerning the perceived value and credibility of the information cues or expertise of the source requires a series of evaluative information judgements on the part of the users. The perception of credibility through information judgement encompasses the assessment of the quality, value and cognitive authority of resources (Huges, Wareham and Joshi, 2010, p. 4; Rich and Danielson, 2007) and hyperlinks nestled in the web environment. For example, in the online search for products and services, consumers are not able to feel and touch the products, so they have to rely on the textual and visual content offered on the websites. Looking for information on products and services online involves discerning salient cues to guide decision making. Furthermore, online consumers seeking health information expect quality in credible and reliable resources to meet their information needs (McKemmish, Manaszewicz, Burstein and Fisher, 2009). Website features such as messages, hyperlinks, archived articles or visual content anchored appropriately on the site can trigger attention and positive assessment of the product online (Hou, 2017; Dolan, Hallsworth, Halpern, King and Vlaev, 2010). In addition, Hou's study suggested that high- and low-anchored cues displayed on the upper and lower level of a website influence consumers when they order food (2017). The benefits can be derived from finding quality source and information, or a cheaper price in relation to other goods and services with similar offerings. Costs include several factors. These are: the time

incurred in reading and reviewing product information, the purchasing risk involved in buying products online and the information risk in acquiring inaccurate information or knowledge. As well, there is the navigation risk such as the presence of online viruses that may infect one's computer or the compromise of personal data and privacy. Research showed that quality information and website quality design are associated with users' acceptance of online retailing coupled with the enjoyment of online shopping and the motivation to return to the sites.

Research (Hsieh, Lo and Chang, 2015) which examined the information design of the website found that the high and low-quality diagnostic information had significant influence on online users' purchasing decisions. Previous study (Hsieh et al., 2015) showed that users tend to evaluate information better which enhance their reason in whether to purchase when encountering high-quality diagnostic websites. Other online consumers information seeking study (Benn, Webb, Chang and Reidy, 2015) revealed that consumers purchasing groceries online pay more attention when there are attractive pictures on the webpage. Users focus more on images than on the text when navigating through the visual content in the product categories. Evidence from Lee and Shin (2014)'s study indicated that product reviews which were enhanced with images draw higher visual attention which augment information processing. Users expect certain value as they evaluate the aesthetic of the pictures to expedite their search. Research on information retrieval and processing (Ozmen, 2015) showed that users directed more focus on specific rather than less specific categories. This demonstrates the users' effort and attention and their discernment in the content during information seeking. Ozmen suggests that information providers need to take into account the users' techniques toward information retrieval.

Using the grounded theory method, Hilligoss and Rieh (2008) further examined credibility at three levels: construct; heuristics; interaction, in identifying an individual's level of credibility judgements (p. 1473). These are explained below:

Construct level: conceptualizes or defines credibility, e.g. believability, trustworthiness.

Heuristics level: general rules of thumb (heuristic or short-cut) to make judgements of credibility e.g. media- and source-related, aesthetics-based.

Interaction level: using specific source or content cues. Content cues may contain secondary cues or peripheral source cues, peripheral information object cues. Peripheral source cues refer to any cues related to the author's background, affiliation, reputation or institution that are used for credibility judgement.

Information judgements are differentiated between predictive judgement and evaluative judgement (Hogarth, 1987). Predictive judgement occurs prior to information seekers' visiting the website, and evaluative judgement occurs during information retrieval with the webpages (Rieh and Belkin, 2000). Rieh (2002) adopted an iterative approach in the credibility assessment process and suggested that users expressed preferences by tapping on their predictive judgement to for a credibility evaluation. Other credibility researchers (Wathen and Burkell, 2002) have suggested the credibility assessment framework for the health information searching process which involves the information seekers' evaluation of appearance, usability or interface design, and information organisation.

The perception of content quality has implications on the characteristics of information cues that may influence users' information evaluation. Users' augment their information search through assessing the value and quality of the surrounding cues (Olston and Chi, 2003). The selections made by the information seekers for information are assessed based on the credibility of the user-generated content of online information (Winter and Kramer, 2012). For instance, the source's website sponsors and website design may project a strong or weak

cue that influence the appraisal of credibility of the site (Flanagin and Metzger, 2001; Westerwick, 2013). The indirect appraisal of information credibility derived from the information cue is considered as an imperfect representation of proximal cues, such as hyperlinks or source credentials (Choi and Stvilia 2015). Restrictive navigational cue, for example, the 'next' and 'previous' page links, may disrupt users' flow experience while moving around the webpages and affect their attitudes and behaviour towards the website (Dailey, 2004; Hoffman and Novak; 1996). Navigation difficulties and performance are correlated with post-use mental effort and satisfactory level of web navigation (Chevalier, Maury and Fouquereau, 2014).

Robins and Holmes (2008)'s experimental study on the relationship of credibility judgement and website aesthetical design demonstrated that websites with better aesthetical quality garner positive credibility rankings. The impression of credibility occurs within the first few seconds when users' view the webpage. However, Robins and Holmes' results did not show the types of visual and informational elements that underlie this information judgement. These authors indicated that a further study should be conducted to examine the features and configuration of the elements on the website that affect credibility appraisal. Findings from a study conducted on users, who were the test subjects, demonstrated that there were positive reactions to a higher quality website, however, the researchers did not specify the type of positive responses that were generated (Tractinsky, Katz and Ikar, 2000). In other study of contextual factors, Dailey (2006) suggested that future research on users' responses to differing web environments should include task variables such as exploratory or goal-directed ones. Conversely, Chevalier, Maury and Fouquereau (2014) suggested that a selection of varying websites (high and low aesthetic) with a complexity of search and post-search perception should be done for an information retrieval study.

Choi and Stvilia (2015) elucidated that the credibility cues may present themselves as positive, negative or neutral cue relevant to the quality of the information. For example, health messages with quality design exude positive information cues as they are perceived to be more informative, thus enhancing the quality and value perceptions of the health-communication content (Lazard and Mackert, 2014). Information seekers tend to assess messages with high quality as more influential than texts with low quality (Duck, Terry and Hogg, 1995).

While some informed users may look for information quality with attributes of usefulness, goodness currency, and accuracy (Rieh, 2002), others may be concerned about its credibility which is the “believability of some information or its source” (Huges, Wareham and Joshi, 2010, p. 4; Fogg, 1999; Fogg and Tseng, 1999; Metzger, 2007; Wathen and Burkell, 2002). Furthermore, Nielson (2001) suggested that a well-design website leads to information search satisfaction and web navigation.

Past research suggested that the persuasive influence of a credible source is more significant than a non-credible source (Eagly and Chaiken, 1993; Petty and Cacioppo, 1986). In information decision making, the popularity of the source and institution, familiarity of the topic, language of the writer, layout or colour of the websites, all have an influence on the user’s “credibility judgements” (Gunther, 1988, O’Keefe, 1990, Rieh and Belkin, 2000, Westerwick, 2013). Fogg (2003) suggested three main sources of web credibility. They include the operator (i.e. organisation or author of the site), content, and design. In addition, Fogg postulated that the ways users assess credibility is because their attention is drawn to the prominence of the cues on the website which leads to their interpretation of quality and trustworthiness.

Many researchers have studied the concepts of credibility based on media environment (Fogg, Soohoo, Danielson et al., 2003; Huerta, 2003; Rieh, 2002), source expertise and content, which were discussed earlier in the preceding sections. However, these studies were

generally based on the premise that the information environments are similar. It would be meaningful to examine if there is an association between credibility judgement and websites.

Topical knowledge and task difficulty

Topical knowledge or prior topic knowledge relates to the information seekers' knowledge of the subject matter or topic (Wildemuth, 2003). Other definitions of domain or topical knowledge referred the familiarity of the subject or system to 'factual knowledge' (Allen, 1991), 'system knowledge' (Dimitroff, 1992) and 'web expertise' (Holscher and Strube, 1999). Prior domain knowledge is believed to support information seekers in their search performance, search efficiency and search agility (Ihadjadene, Chaudiron and Martins, 2003; Savolainen and Kari, 2004; Widemuth, 2004). Various researchers have studied the relationship between topical knowledge and information search behaviour. For example, results from studies on reading duration and efficacy (Kelly and Cool, 2002) and query and vocabulary expansion (Vakkari, 2002) found that search behaviour varies with the knowledge and familiarity of the subject. Hearst (2009) suggested that in executing and evaluating information search task, the less knowledge the individual possesses in relation to the information task, the less they will be able to frame the search goal, which affect their evaluation of information. Juvina and van Oostendorp (2004) posited that users' domain knowledge affect their navigation pattern. In addition, users equipped with topic knowledge and web search experience employ better flexibility in their search strategies, for example, by switching search engine when facing challenges during information retrieval (Holscher and Strube, 2000). User subject knowledge and information literacy levels (Arazy and Kopak, 2011; Ahmad, Wang and Hercegfı, 2010) also play a significant role in the credibility assessment of websites (Choi and Stvilia, 2015).

The study about information knowledge by Shiri and Revie (2003) on cognitive and search moves (tactics, search formulation), showed that those with topical knowledge engaged

in more moves than those who were unfamiliar with the topic search (Marchionini, Meadow, Dwiggins, Liu, Wang and Yuan, 1991). Shiri's research indicated that users of higher level of topic familiarity were able to formulate relevant queries and terminologies (2005). Other study (Liu and Belkin, 2014) on task and users' writing and searching behaviour, found that users with higher topical knowledge showed no difference in the two tasks, and users with lower topical knowledge spent longer time searching. These studies imply that cognitive state and proficiency of the subject matter influence information users' searching strategies and information evaluations.

Additionally, Pennanen and Vakkari (2002) whose study on users' knowledge suggested that subjects who possess topic knowledge were more critical in judging the usefulness of the references, leading to successful search performances. Kelly (2006a; 2006b) observed the correlations between task, topic and usefulness judgement in her study of seven subjects over a 14-week period in a naturalistic information seeking context. Although usefulness was analysed in how subjects relate to the believability of the documents in completing their task, it was not clear on the type and users' interpretation of the usefulness of the searched content. According to Chen, Lin, Yen and Linn (2011), elements such as value and quality of content, influence the 'scent' of the website. Familiarity reduces users' disorientation (Chen, Lin, Yen and Linn, 2011), especially when they encounter uncertainty and confusion during web navigation. Otter and Johnson (2000)'s study found that when the information cue was low in the web environments, users became disoriented and the frequency of web navigation tend to decrease. From their questionnaire surveys, they found that users' non-familiarity of the site, including its content and terminology, and the depth of the website were key aspects of the disorientation. In other research (Lucassen, Mullwijk, Noordzij and Schraagen, 2013), results demonstrated that users who have knowledge of the subject tend to focus on semantic features of the content, and users who were unfamiliar with the content directed their attention on

surface features. These evidences suggest that users who have knowledge of the task topic are able to expedite the evaluation of the content (Kelly, 2006a).

Based on the review of these literatures, topical knowledge in this study refers to users' familiarity with topic or subject, whether they have searched for the topic before.

Task Difficulty

Task influences web search behaviour and precision (Kim and Allen, 2002), and the type of task affects different techniques and search outcome (Xie, 2009). Performing a search task relies on the information seekers' perception of the task requirements and decision-making in evaluating criteria of the information selection. Kelly (2006a) suggested that an individual's perception and interpretation of a task relates to its subjectivity, while performing a task refers to its objectivity.

The evaluation criterion is dependent on the information seekers' formulation of potential task difficulties (Ingwersen, 1992). Bystrom and Hansen (2005) describe a complex task or task complexity as one consisting of "specifiable smaller subtasks" (p. 1052). Task complexity and task difficulty carry different constructs (Wildermuth, Freund, and Toms, 2014). A task that involves a series of subtasks or path in a search goal denotes task complexity (Campbell, 1988; Liu and Li, 2012), and fact-finding in nature (Marchionini, 2006). Task complexity is operationalised as the number of sub tasks to be carried out (Pharo, 2002), and 'multiple subtasks' (Albertson, 2010, p. 243). For example, Singer, Norbistrath and Lewandowski (2013) constructed complex search tasks to include various steps for completing an information search goal.

Task difficulty, originally defined by Campbell (1988) as difficulty that requires effort to conduct a task, relates to the task performers' perception of the task complexity (Li and Belkin, 2008). Task difficulty has caught the attention of researchers in information search (Freund and Toms, 2014; Liu, Kim and Creel, 2015; Wildemuth, Liu, Liu, Cole, Belkin, and

Zhang, 2012, Vakkari, 1999). In a study by Liu, Gwizdka, Liu and Belkin (2010), task difficulty was measured, by eliciting responses from lab-experiment subjects, through ratings of the perceived level of task difficulty. Task difficulty is determinant on the users' characteristics such as information retrieval experience and topical knowledge and intrinsic knowledge of web search; for example, assessing or web navigation (Gwizdka and Spence, 2006). Other studies (Bystrom and Jarvelin, 1995; Kumpulainen and Jarvelin, 2010, Kumpulainen, 2013) showed that task difficulty is related to the information types and information items, and that this perceived difficulty and information interactions varies at different level of task complexity.

Previous study (Blackmon, 2012) on task difficulty and the user's attention on a webpage was generated from the links-clicked data. His finding reflected that participants who took on difficult tasks were less successful in task completion. The result from the experiment (Blackmon, 2012) showed that a higher number of links displayed on a webpage, for example, 93, leads to a higher success rate of task completion. However, Miller and Remington (2004) posited that eight links per webpage is sufficient. Other eye-tracking research (Wittek, Liu, Daranyi, Gedeon and Lim, 2016) on information search behaviour, based on risk and uncertainty, found that users' cognitive level and perceived search task difficulty were associated with their eye-gaze and information seeking behaviour. In a study conducted by Monchaux, Amadiou, Chevalier, Marine (2015) on the influence of prior domain knowledge (expertise level) and problem complexity on performance, they found, for example, that users who are experts, with psychology-related knowledge, were able to reformulate and produce more relevant queries and thus attained correct answers for the task.

In light of these studies on topical knowledge and task difficulty on search behaviour, it is evident that information seekers adopt complex cognitive level and cognitive effort (Monchaux, Amadiou, Chevalier, Marine, 2015) during the information searching process.

Users who possess domain or topical knowledge are able to apply critical information processing skills to solve information problem.

However, past studies mainly focused on domain or topical knowledge and task difficulty on search strategies and skills. There was less attention paid on the effect of topical knowledge and task difficulty on users' information judgement, specifically the evaluation of websites. While this thesis considers credibility assessment at the different levels of construct, heuristic and interaction, articulated by Hilligoss and Rieh (2008) it also integrates task specificity and evaluation. Hence, the following research question aims to examine task specificity that include topical knowledge and task difficulty and website evaluation.

RQ3 : How does task specificity affect users' evaluation of website?

It is important to address these gaps as information seeking behaviour involves the users' overall cognitive processing behaviour. Web credibility assessment needs to incorporate the examination of the unique features of the user-generated content and specific contexts surrounding users' information behaviours (Choi and Stvilia, 2015). Information users adapt an iterative approach to navigate within the webpages (Hilligoss and Rieh, 2008), and effort are exhibited through their preferences and mental effort that involve defining, redefining, and modifying search techniques and queries for effective information seeking outcome.

Chapter Summary

This chapter analysed the literature relating to the information seeking theory, specifically the concepts of user effort, hyperlinks, task specificity and website evaluation. This chapter discussed previous studies and literature reviews of the characteristics of task (e.g. task specificity, task difficulty), topical knowledge and information evaluation. Through the extensive literature review, there is a lack of studies on user effort, task specificity in hyperlink engagement and evaluation. Thus, my research questions are aimed at addressing these gaps. The theoretical framework is presented in Chapter 3.

Chapter 3

THEORETICAL FRAMEWORK

The literature review in Chapter 2 sheds light on the scope for the further examination of information seeking involving user effort and task factors in engaging the hyperlinks and information judgement. The following sections explain the synthesis of the information seeking concept illustrated in the theoretical framework (Table 1). The section provides an elucidation of the relationships of effort, task specificity and hyperlinks and evaluation

To achieve an optimum search for information, time and cost invested in meeting information need should be considered, as users may exercise differential effort relating to task and on different websites. For example, reducing effort may be expressed in the choice selection of hyperlinks to help users navigate the webpages. The effort can be assessed through users' link-clicks and gaze interactions.

Hyperlinks allow news websites to connect through networks on the World Wide Web, implying a flow of information (Himmelboim, 2010). The two major factors choice of hyperlink selection are based the clue interpreted from the hyperlink and the user attention and effort. Hyperlinks embedded within the text content or image are often related to as proximal cues (Pirolli, 2003; Sundar, Knobloch-Westerwick and Hastall, 2007). The users' effort are expressed in their navigating decision, for example, to exit the current site when the information cue of the current site is low (Card, Pirolli and Van Der Wege, 2001). Conversely, the choice to click on the hyperlinks to navigate across the webpages denotes information filtering and users attempting to reduce their effort.

For my study, user effort is measured through the number of link clicks and fixation on the visual elements (text, images, categories), to examine the users' interactions with the

hyperlinks and visual and text elements. Further data collection is generated from the interview responses based on users' perceptions and interactions with the links and cues.

The web environment comprises a plethora of informational resources that are delivered through hyperlinks and visual elements to aid web navigation. As explained in the literature review in chapter two, these proximal cues within the webpages may produce an information scent; either strong, weak, or no scent (Sundar, Knobloch-Westerwick, and Hastall, 2007) where it directs information users in determining the value or the relevancy of the content. The subjective appraisal of content displayed on the websites is determined by the individuals' characteristics and their immediate attention on the aesthetical aspects of the design in each site (Chevalier, Maury and Fouquereau, 2014). The initial impression of the website design has an impact on the users' positive or negative evaluations of the website (Thielsch and Hirschfeld, 2012). Conversely, the hyperlink mechanisms displayed on a website has implications on affecting user effort in engaging the elements to meet their information task goal.

Task factors. Information seeking denotes the process of conducting continuous steps in cognitive searches and leveraging on prior knowledge and experience. As the goal of information seeking is to fulfil task at hand or to resolve a problem to fill the gap of obtaining information (Case 2012), it is important to examine the contextual and cognitive factors that affect users' information seeking (Blackmon, 2012). The strategies and techniques of information seeking may be influenced by the task factors and prior knowledge of the source. Conversely, the predictive judgement may arise from perceived task difficulty due to a lack of subject knowledge and the evaluative judgement of assessment of the quality of the current content on the website. It is important to understand users' task and their problems in information retrieval (Belkin, 1982; Ingwersen, 1992) as these factors affect information foraging behaviour as users aim to optimise the return of their search. In this respect, users

leverage on their mental effort in interacting with different systems and elements during information seeking (Norman, 1983; Young, 1983). The cognitive perspective of the mental model in information foraging may be affected by factors such as users' search differences, experience (Thatcher and Greyling, 1998), task (Zhang, 2012), topical knowledge, or gender (Zhang, 2008). Furthermore, Xie (2009) suggested that the purpose of the search task has implication on the search strategies (Xie, 2009).

Task characteristics in this study relate to task specificity, perception of task difficulty, and knowledge of the topic. Two task specificities are defined as information-seeking task instructions: *non-specifically task*; *specifically-defined task*, or *well-defined task*. Non-specifically defined task contains general information search instructions while specifically-defined task includes specific requirements for the information search. These variations are established to embed the certain task complexity in the searched task. For example, for a *specifically-defined* task, three specific sub-task instructions are added, while for the *non-specifically defined* task, general and vague instructions are given. Task instructions will define the content within the information search requirements, e.g. find travel information in South Africa.

Task difficulty evaluates the users' problems in searching for information relevant to the task instructions or to meet the information task need. Task difficulty is assessed through asking participants for their perceived level of difficulty in the information search of the topic on the website (Liu, Gwizdka, Liu and Belkin, 2010).

Topical knowledge refers to a user's subject knowledge related to the specific topic indicated in the information search task. Although previous studies (see Gattis, 2002, McCart, Padmanabhan and Berndt, 2013, Tomasi, 2014) have attempted to examine users' information behaviour in interacting with information cues, little has been done in the area on the relationships of task factors and knowledge of the subject in the evaluation of characteristics

of information cues that transmit different information cue on different websites. Topical knowledge is measured through the dichotomous yes-no questions to show users' knowledge of the search topic.

Outcome. As described in the theoretical framework above, the process of information foraging involves users' interactions of information cues, in which actions are enacted by means of environment enrichment within the webpages. The influencing factors of the context (task and topical knowledge) affecting information seeking and foraging behaviour were explained in the preceding sections. The users' effort in assessing the cost and value in the search process, can be derived series of actions such as viewing, clicking, scanning information, navigating from a webpage to another webpage.

The hyperlinks and information cues are evaluated through the users' engagement of links and the attentional focus of cues.

User effort is measured by the link-clicks and durations of eye fixations, in which data are generated by the eye-tracker.

Engagement of hyperlinks is measured through the link-click analysis, and data are generated by the eye-tracker.

Credibility evaluation is derived from participants' ranking on the level of credibility based on 1, being the least credible to 7, being the most credible. Interviews with the participants will show an in-depth understanding in the interpretation of information credibility

The theoretical framework illustrated in Table 1 provides an overview of the research.

Table 1 *Theoretical framework*

CHAPTER 4

METHODOLOGY

This chapter describes the overall research design of this study. The section begins with describing the rationale for employing the mixed methods approach for the data analysis. Next, the chapter discusses the research design that consists of an experiment using eye-tracking tool, followed by interviews and questionnaire surveys. In this computer-laboratory experiment, the study used the eye-tracker software to record users' eye fixations, durations of gaze interactions and link-click activities. The data was gathered from the eye-tracker record, questionnaire surveys and interview responses. The coding method was applied for the qualitative content analysis based on the post-experiment interviews. Additionally, the chapter explains the methods of participants recruitment, experiment procedures and set-up, pilot study and measures. In addition, this chapter specifies the operationalisations of concepts, and give an overview of the research objectives.

This research employed the mixed methods approach, integrating the quantitative and qualitative analysis. Mixed methods approach comprises the combination of the quantitative and qualitative analysis, approaches, methods and concepts into a single study (Bankins, 2011; Creswell and Plano Clark, 2007; Johnson and Onwuegbuzie, 2004; Luyt, 2016). Creswell and Plano Clark (2007, p.7) proposed the combination of the methods to include “merging or converging the datasets by integrating two datasets within the other so that one type of data provides a supportive role for the other dataset.” For example, Robinson and Mendelson (2012) employed a hybrid method research, where the participants were randomly assigned for the experiment. These authors (Robinson and Mendelson, 2012) advocated that the advantages of using the mixed methods within one study enhance triangulation of the analysis (p. 333). Robinson and Mendelson (2012) suggested that adopting a combined approach to

examine the “output evaluations” (p.334) contributes to more holistic findings. The mixed methods research could retool methods and tradition, such as employing it in grounded theory study (Hesse-Biber and Johnson, 2013).

Bryman (2007) suggested that it may not be necessary to merely test findings against the quantitative and qualitative components, but rather to integrate the overall account of results to bring about a meaningful debate. The strengths of the quantitative and qualitative method override the limitations, as “words can add meaning to numbers and numbers can add precision to words” (Johnson and Onwuegbuzie, 2004; Suter, 2012, p. 370). Furthermore, in Bryman (2007)’s interviews with researchers on his investigations of mixed methods research, he enlightened that it is possible for one set of data, either the quantitative or qualitative data, to produce more striking information.

Research Design

The present study employed the mixed methods conducting quantitative analysis of the eye visualisation data, questionnaire surveys and the qualitative content analysis of interview responses. The objective of the interview is to delve into the participants’ information processing behaviour and their perspective of information cues and the search tasks. The questionnaire surveys were designed to understand the participants’ perceived information credibility relevant to the quality of the webpages, and the information cues. The methodological triangulation (Denzin, 1970) of survey and interviews aims to strengthen the reliability and validity of the interpretation from the eye-tracking logs analysis. The comments elicited from the interviews add meaningful narrations to the quantitative data. For instance, the qualitative analysis from the prolonged fixation on an object may be interpreted as the individual’s engagement (Just & Carpenter, 1976) or difficulty in deciphering the content (Seong & Chae, 2013). The examination of quantitative and qualitative data allows for deeper

analysis and context than merely testing hypotheses (Jason and Glenwick, 2012). Hence, the rationales for employing a mixed methods research in this study is to strengthen the validity of the findings, be it within a single- or multiple-mode design (Hesse-Biber and Griffin, 2013), prevent biases intrinsic to single-method approaches (Denscombe, 2008, p. 272), and save cost and time (Joinson, 2005; Fox, Morris and Rumsey, 2007; Teddie, Tashakkori and Johnson, 2008).

Table 2 provides an overview of the research objectives that include the research goal, gaps, methods and research questions.

Table 2 *An overview of research objectives*

Eye-tracking method

Eye tracking studies have gained traction with the academic and usability researchers in investigating users' interactions with the visual features and eye fixations in the web-based environment (Eraslan, Yesilada & Harper, 2016; Guan, Lee, Cuddihy, & Ramey, 2006; Seong & Chae, 2013). By analysing the visual eye-movement activities and the individual's cognitive information processing, it offers insights into users' information search strategies (Russo and Leclerc, 1994). In the domain of web search study, eye-tracking mechanism can be employed to examine users' gaze interactions in which it acts as proxy (Cutrell and Guan, 2007) for their effort on the web environment. For example, past researchers (Josephson and Holmes, 2002) studying eye gazes on websites and task performance on web portal page administered the eye-tracking methods (Goldberg, Stimson, Lewenstein, Scott, and Wichansky, 2002). Other information researchers (Pan, Hembrooke, Gay, Granka, Feusner and Newman, 2004) produce results of eye fixations, which observed that female users engaged in a shorter mean fixation duration than male users on web pages. The female users tend to spend longer time looking at the first page than the subsequent pages. Additionally, in study by Lorigo, Pan, Hembrooke, Joachims, Granka and Gay (2006), they found that task affects fixation durations and web navigation.

However, these studies generally focused on the gender and google ranking page, without defining the features and characteristics of the information cues on different websites, which may influence information searching behaviour.

Key eye-tracker analytics can be performed to examine the visualisation data, such as heatmaps, gazeplots or the areas of interest (AOIs).

Heatmaps

The visualisation analytics help in “assessing the user information search task performance (e.g. reading, scanning, scrolling), attention patterns, interest in various elements,

and problem-solving strategies.” (Tobii, 2013). A common computation of eye tracking metrics includes fixation durations, fixation counts (for scanpath or gaze interactions) and areas of interest (AOIs). Amongst other visual and perceptual visual analysis such as heatmaps, identifying points of interest offer useful output measurement for eye movement analysis metrics (Salvucci & Goldberg, 2000).

Heat maps record direct focus of the spatial-temporal data (Coltekin, Fabrikant & Lacayo, 2010). However, it is generally inadequate to rely on heatmaps for a detailed analysis of the eye tracking patterns as they reflect only direct hot spots of a participant’s gaze. It lacks in projecting a sequential order of the point of interest or region of interest where users track during information search (Raschke, Blascheck & Burch, 2014). Hence, to ensure the internal consistency of measurements, it is beneficial to generate quantitative and qualitative data on the fixation durations and link clicks activities and interviews and surveys.

Areas of interest (AOIs)

AOI tool allows particular elements on the webpage (e.g. headers, advertisements, images, text) to be selected for analysis of gaze fixations on the static or moving objects, such as images, movies, screen recording, web pages etc. (Tobii 2013). A minimum threshold of 100 milliseconds (1 second) was set for the eye-tracking metrics, a standard fixation threshold value for eye-tracking studies (see Coltekin, Fabrikant & Lacayo, 2010; Goldberg & Koval, 1999; Jacob & Karn 2003).

Raschke, Blascheck and Burch (2014) suggested that the metrics of eye tracking data can be analysed using t-tests, ANOVA or standard statistics.

The following paragraphs explain the eye-tracking terminologies that will be mentioned throughout the report.

Fixation refers to stable eye position within a certain threshold of dispersion (Pan, Hembrooke, Joachim, Lorigo, Gay and Granka, 2007), and may range from about 50 and 500

milliseconds (Irwin 2004; Henderson and Ferreira, 2004). These matrices enable the measurement of the frequency of fixations and duration of fixations, which reflect the significance and value of the information cues on the webpages as perceived by the users.

Saccades or scanpath (refers to *gaze interactions* in this paper) are ballistic movements or sequence of fixations (Pan, Hembrooke, Joachim, Lorigo, Gay and Granka, 2007). It varies in amplitude (size) from small fixated movements to large movements made while gazing the target or when reading (Purves, Augustine & Fitzpatrick, Katz, LaMantia, McNamara and Williams, 2001).

Participant recruitment

An invitation to the undergraduate students for the research participation was announced through the online research participation registration system (SONA) at the Nanyang Technological University (NTU), Wee Kim Wee School of Communication and Information (WKWSCI). Students from various areas of disciplines at NTU had access to the system. Post-graduate students enrolling in Master's courses were also invited to take part in the research. Students were recruited for this study as they are more likely to be involved in information search relating to their studies, and their familiarity with the Internet and social media platforms from their web use experience. Information search on the Web is commonly used in schools and universities, and students generally perform search on Google (Rieger, 2009). The non-probability sampling method such as the convenience sample, has been generally used in studying users' behaviour on the Internet (Pornsakulvanich, Haridakis and Rubin, 2008). Conversely, students are recruited for the online usability study for their availability and timely coordination (Stangor, 2010) within the campus. Although there are limitations of convenience sampling relating to the valid representation, Wimmer and

Dominick (2014) argued that probability sampling may not necessary guarantee a representative sample from the population even when systematic selection is adhered to.

The limitations of sampling and generalisability can be mitigated by the heterogeneous sample of participants from the various disciplines as the students come from different schools. These participants are equipped with different levels of information literacy and search knowledge and skills, and they naturally demonstrate a varied degree of information seeking behaviour (Roscoe, Grebitus, O'Brian, Johnson, and Kula, 2016). Hence, it is reasonable to draw a parallelism between the student participants and the general population of working adults with diverse information literacies as information-literate users similarly encounter challenges in distinguishing between reliable and unreliable sources due to their search experience and topic knowledge (Wiley, Goldman, Graesser, Sanchez, Ash and Hemmerich, 2009). In terms of information literacy, the sample in this study provides a reasonable range of online users to permit generalisability relative to the broader population of online information users.

The frequency of the students' usage of search engines and the internet were reflected in their responses to the survey questions, based on a Likert scale of 1-5, '1' being least frequently to '5', being most frequently; "*I browse the Internet using search engines for general information search*", 80% most frequently ($N=160$), $M = 4.76$, $SD = .52$, and "*I use direct URL address (website address) for information search.*", 96%, $M = 3.58$, $SD = 5.32$.

The study was conducted over two semesters, from January to April, and September to November, 2015. Participants were offered the options to choose either one course credit or an honorarium of \$15 per hour for their involvement in the research. Course credit was only offered to undergraduate students enrolled in the Fundamental in Research, and the Media Law courses as part of their research assessment components.

The SONA system facilitated the research registrations online, with pre-scheduled dates and time-slots stipulated in the system. Participants indicated their interest by signing up online according to the dates available, and an email confirmation was sent to the student's email account. Upon confirmation of their registration, the student-participants turned up at the computer laboratory at the Cool Asia office at the Wee Kim Wee School of Communication and Information building at NTU.

Participants

202 students from diverse schools of disciplines participated in this study: namely Communication and Information Studies, Business, Humanities and Social Sciences, Electrical Engineering, Mechanical Engineering, Engineering and Material Science participated in the experiment. 42 participants' logs were excluded from the study due to errors in eye calibration (18 participants) and screen recording (24 participants). The unsuccessful eye calibration was due the participants' eyewear that interfere with the calibration and intermittent computer malfunction which affects the recording of eye-movement. The interference of the eye-wear with the reflection path, such as contact lenses, bifocal and trifocal glasses, large pupils or "lazy eye" (Poole and Ball, 2005) can cause eye-calibration failure. For the screen recording, the Tobii T60 eye tracking software is installed with Internet Explorer (IE) browser by default. On several occasions during the process of the experiment, the IE system stalled intermittently, where the web navigations and real-time logs were not captured successfully.

In total, 160 participants (Male = 38%, Female = 62%) were included for this study. The 80 participants randomly selected for each group were established proportionately, after excluding the participants' data with error in eye-calibration and screen recording. Participants' ages range between 18-24: 97%, 25-30: 2%, and 31-39 : 1%. The participants from the various

schools included WKSCI 86%, Business 4%, Humanities and Social Science: 1%, Electrical Engineering: 3%, Chemical and Biology: 2%, Material Science: 2%, Chemical and Electrical Engineering: 1%, Mechanical Engineering: 1%.

Pilot study

Prior to conducting the main study, 10 students were recruited from the polytechnics and NTU schools for the pilot study, over a period of four weeks from mid December 2014 till January 2015. The test was administered to ensure the smooth facilitation of the experiment for the main study. The assessment of the eye-tracker tool, clarity of the instruments of the task instructions, questionnaires and interview questions, and the responses of the subjects to the task instructions were monitored and reviewed. Poole and Ball (2005) suggested that this test is necessary to ensure an accurate point-of-regard measurement. The pilot test allows the researcher to ensure the position between Tobii's primary stimulus presentation screen and the participant are placed at the correct distance. The data of the pilot study were not included in the main study.

From the exploratory test, the frequencies percentage associated with information seeking techniques, ($N = 8$) showed the initial search tactics were keyword search (71%), followed by domain recall (14%), and popularity of the websites or the source (i.e. higher frequency of visits) (14%). Domain recall refers previous knowledge or familiarity with a particular source, field or subject. (Allen, 1991; Ju, 2007; Wildemuth, 2004). In this research, topical knowledge was used to examine users' past knowledge of the subject-matter.

Users' search techniques and evaluative judgement of information, was demonstrated. On following information cue derived from the interactions with the information cues, the frequency statistics show the engagement of the cues: reading reviews (25%), links (25%), new tabs (13%), headings (13%), google search (13%) and message content (13%) appear to

be common information processing criteria. Information cue-following through clicking activities occurred when the users were drawn to the categorical headings to find more information, or the top-ranking websites generated by the search engines.

During the test, some issues such as the unsuccessful calibration of the eye-movements, either due the reflections from the eyewear or the posture of the subjects' sitting position, were identified. Following the pilot test, the experimental instruments such as the task instructions and questionnaire surveys were improved for clarity.

Websites

To align with the conceptual research in examining hyperlinks and information cues, two websites that featured travel and food topics were selected for the experimental study. Surveys have shown that travel and food topics are emerging trends in online search. For example, 73% of users search for travel information on the internet (Kim, Xiang, and Fesenmaier, 2015; Pew Research, 2009). On a daily basis, about 1.5m visitors per day search for food information and reviews online (Parikh, Behnke, Vorvoreanu, Almanza, and Nelson (2013); Alexis.com, 2012).

Based on past studies, it is common for the researcher to select different websites with varying designs and quality of information or articles in order to delineate the participants' distinction of aesthetic features of the site (Lucassen and Schraagen, 2012; Robins and Holmes, 2007). The websites, Lonely Planet, which covered topics related to travel and the food blog webpages which were about food were selected for this study. The Lonely Planet website recorded a daily page view per visitor of 2.03 (Alexis.com, 2017). The food blog site is ranked as one of the top 50 food blogging sites in Singapore (Blog Feedspot.com, 2017). Social media researchers have recognised that blogs, compared to traditional media, are garnering more attention and credibility from consumers seeking information (Agarwal and Liu, 2008; Johnson and Kaye, 2009; Ko, 2012).

The two websites offer a similar display of diverse information cues such as text, pictures, headlines, archived articles, and advertisements organised as links. The presentation of other information cues such as text descriptions, banners, social media icons are sequentially displayed. For example, the top page of the travel website shows the classifications of 'search', 'video', 'destinations', 'bookings' with embedded links. The images were attached with hypertext, and had short descriptions set out below the images. A click on a visual object links the user to another webpage. In addition, the 'price' and 'location' hyperlinks are displayed on the right side of the webpage. However, the layouts of font and size vary. They are presented in black and white; if the text is displayed within the box, the font is displayed in white on a black background.

For the food website, a banner displaying the source of the site is displayed at the top of the page. The headers of the food topic, restaurant or food outlet are embedded with hyperlinks, with text descriptions located just below the headers of the topics. Images are link-clickable although there are no texts written on the pictures. Additionally, links to the categories of the topics are displayed on the right side of the webpage to enable users to click on the links to access past articles. The hyperlinks of advertisements are displayed at the top right panel. A standardised font in brown is used throughout the website's webpages.

Although the two websites present a variation of designs and layout, these sites offer sufficient information cues of hyperlinks, visual and text elements for the purpose of this research. Figures 3 provides a partial sample of the webpages of the travel and food sites.

Figure 3a Food website (partial webpage) – contains headers link, categories link, 'read more' link, and picture

Figure 3b Travel website (partial webpage)– contains hyperlinks embedded in pictures, categories, headers

Moreover, these gender-neutral sites were selected to appeal to both male and female participants. Past experimental study on navigation behaviour in virtual environment (Cutmore, Hine, Maberly, Langford and Hawgood, 2000) showed that landmarks provide useful navigation cue for both genders. In other study of gender and website design (Cyr, Bonanni, Bowes and Ilsever, 2005), results showed no statistical significance on the gender differences on website trust (Balasubramanian, Konana and Menon, 2003; Cyr and Bonanni, 2005; Solomon, Zaichkowsky and Polegato, 1996). Garrett (2003) suggested that visual design, information architecture, information design, navigation design, content and interaction design are important for user search experience. Positive navigation experience and perception of a well-design website results in search satisfaction (Agarwal and Venkatesh, 2002; Fogg, Soohoo and Danielson, 2002; Hoffman and Novak, 1996; Nielsen, 2001). Hence, this research takes into consideration the sufficiency of these cue elements in the selection of websites for web usability study (Garrett, 2003).

The concept of information patch relates to the webpages located within the websites that are populated with information cues such as hyperlinks, visual and text elements. The webpages are connected with hyperlinks that guide users' web navigations. In this study, information patch is characterised as a set of webpages. The websites are categorised as independent variables and within-subjects variable.

Procedure and set-up

Tobii T60 eye-tracking system is connected to a laptop in a computer laboratory in Cool Asia office at Wee Kim Wee School of Communication and Information building, for a distraction-free experiment. Upon arrival of each participant, the researcher explained the informed consent, and obtained his or her signature on the form before starting the information search tasks (Appendix A). This is in adherence to the research procedure of the university's

Institutional Review Board (IRB) regulations. Consent was sought from the participants for recording the interviews. The experiment was conducted in a single session with each participant, due to only a single computer that is installed with the Tobii T60 eye-tracker software. The eye-tracking information search experiment lasted between one and 1 ½ hours.

After the participants had finished reading the task instructions, the researcher led him/her through the eye calibration procedure. The participant was instructed to fixate their eyes on the calibration point as it moves over the screen. Eye-calibrations were recorded for both tasks. Upon successful calibrations, the participants began the information search tasks. Although the participants were allowed to refer the task instructions list where it was attached to a board (at the eye level) next to the computer, they were advised to not look away from the screen to prevent the eye-movement data to be recorded properly.

Method

The experiment was conducted using between- and within-subjects design (See Table 3). In between-subjects groups, the 160 participants were randomly allocated to the control and experiment groups, in which 80 participants were assigned to conduct the specifically-defined tasks (*'Specific'* task), that is the experimental group. Another 80 participants were assigned to conduct the non-specifically defined (termed as *'Non-specific'* task), who are in the control group.

Table 3 *Within- and Between-subjects experimental conditions*

Within-subjects (Topics)	No. of participants	Between-subjects (Type of search task)	No. of randomised participants
Travel	160	Specific task	80
Food topics		Non-specific task	80

As the participants registered their interest and selected the date and time to attend the eye-tracking experiment, every registrant was given an equal chance of participating in the research. To ensure the efficient use of time, and to avoid any bias, the random sampling was administered by assigning a number to each participant. This process was followed by assigning each participant to the respective search task groups, that is the specific and non-specific task groups. As Ellison, Barwick and Farrant (2009) suggested, this random sampling technique, also termed as ‘herringbone’ sampling, can be generated by alternating the participants, using a starting number. In another study on web search with search task conditions, Collins-Thompson, Rieh, Haynes and Syed (2016) rotated the order of two search tasks to the subjects, as a random sampling technique, to eliminate any ordering bias.

In this study, *non-specifically defined* task (*Non-specific task*) provides general instructions for search on the topics. “*Specifically-defined*” task (*Specific task*) is task given with additional instructions, for example for search instructions on food topic – “*search for seafood restaurants in the east zone*”, and for travel topic, “*search for three places of interest in South Africa*”. Participants were only given the instructions for travel and food topic information search, but the types of task (e.g. non-specific or specific) were not indicated to them. The information search tasks were manipulated to measure the condition and difficulty of the information seeking goal relating to users’ attention and perception of the websites. Widermuth, Freund, and Toms (2014) suggested that the instructions in the assigned tasks can be manipulated to match with the terms in the target documents or webpages. The words that are prominent in the task instructions may not appear in the target documents or webpages. This task manipulation seeks to examine the difficulty encountered by the participants as they expend their effort in retrieving the information. In Khan and Locatis (1998)’s research, they established different levels of difficulty by varying the search words in the task descriptions to determine the word appearance in the target documents. In other online information search

studies (Fraser and Locatis, 2001; Lazonder, Biemans, and Wopereis, 2000), a target URL of the location of site was provided for the search task. Kim (2006) constructed three types of tasks based on factual, interpretive, and exploratory tasks to examine the users' perceived level of difficulty during information retrieval. In addition, Liu, Liu, Cole, Belkin, and Zhang (2012) administered different levels of task difficulty based on keyword search in their information search study. Liu, Chang, and Creel (2014) designed four task facets: product, task purpose, complexity and named task (specified search target) for their study of task types and user knowledge.

Guided by the approaches in the task-related information seeking studies discussed above, that incorporated variations in task descriptions and the target page (Widermuth, Freund and Toms, 2014), the present research incorporate different levels of task specificity in the search task instructions, to assess users' level of tasks difficulty in information seeking.

The instructions for travel and cuisine topics searches were randomly assigned to participants as their first task regardless of which group they were allocated to. The task instructions were established as (1) task with non-specific (general) instructions and (2) task with specific instructions (Appendix A). Participants were told that they do not need to write down the search results, as the data would automatically be recorded and stored in the system. In previous study (Zhang, 2012), similarly, two types of information seeking tasks were administered, one with factual questions that contained less ambiguity while the second complex questions involved research-oriented task. The different types of tasks were given to represent different information needs.

To reduce the incidents of experimental fatigue, the time allocation was restricted to ten minutes for each information-searching task on travel- and food-related topics. Participants were required to complete two randomised information searching tasks; one task was given the duration of 10 minutes to complete, and for the second task the time was not specifically

indicated to the participants although the participant was prompt to complete the task within ten minutes. This is to create the condition of non-time pressure from the outset of the task.

The design of the study was to align closely to the naturalistic setting of the individuals' information retrieval from the Internet. Participants were also able to navigate to other websites to look for information pertaining to the task instructions. The selection of the two websites for this eye-tracking information seeking behaviour represents the natural setting where participants were used to search for information in the Internet. The choice of websites allows the researcher to assess users' search behaviour in different information environments. The websites set up for this experiment are the *LonelyPlanet.com* (LP) for the travel-related topic and a food blog website (FB) for the cuisine-related topic. To respect the privacy of the food blog site, an anonymous name FB is used in this study.

Past researchers generally selected two sets of stimuli, that is documents or websites for web search study. For example, Lucassen and Schraagen (2012) conducted an experiment that involved participants' evaluation of trust and quality on two different Wikipedia articles and they differentiated the site articles between high and low-quality articles. This distinction of web articles ensured that participants were given meaningful credibility evaluation (p. 571). Similarly, Robins and Holmes (2007) selected stimuli of websites with varying designs, with high and low aesthetic layout, in their study of subjects' evaluation of credibility and aesthetical design of the websites.

The websites, LonelyPlanet and the Food blog display some level of similar and differential information cues (text, pictorial, categorical link cues on its websites. The different aesthetical layout and designs, colours, and convey different domain familiarity to the information seekers (See Figures 3a and 3b for travel and food websites). Blackmon (2012) supported that it is possible to generate feedback on attentional weights on a given website. In the sequential processing of links study conducted by Fu and Pirolli (2007), the authors

suggested that analysing attention on webpages should consider variations in visual layout. Similarly, Winter and Kramer (2012) investigated the influence of source cues of online science blogs on users' decisions in reading content, had selected a predetermined website by creating a page of weblog with links for their experiment. In other research on information cues on links (e.g. Chi, Rosien, Suppathanasiri, Williams, Royer, Chow, Robles, Dalal, Chen and Cousins, 2003 and Fu & Pirolli, 2007) users were presented with specific information searching and navigation tasks on the prescribed websites.

Measures

Dependent variable

The dependent variables include the measurements of eye-movement fixations on the informational cues, mouse-clicks on hyperlinks, web navigation and perceived information credibility. These measurements are crucial for the examination of the effort expended by information seekers. The attention focus and user effort invested during their information searches can be assessed through the engagement of link-clicks, while the breadth and depth of information seeking (Hodkinson, Kiel, & McColl-Kennedy, 2000) can be derived from the users' scanning of a variety of webpages or reading comments, including the time incurred in completing the tasks. Furthermore, Fadel, Meservy and Jensen (2015) highlighted that using the eye-tracking tool to capture the mouse-clicks, fixations and time durations allows for objectivity and precision in analysis.

Users tend to assess the value and cost of information search during web navigation that implies the behaviour of information evaluation. Hence it is pertinent to understand users' evaluation of information and the factors that affect their assessment.

In summary, the following are the **dependent variables**:

- Hyperlinks measured through the number of mouse-clicks.
- Information cues measured through fixation durations

- Web navigation measured through number of web pages visited
- Credibility evaluation measured through the questionnaire survey, on the scale of 1 (being the least) to 7 (the most) on the level of credibility

Independent variables

The independent variables are the websites (travel and food blog sites), task specificity (specifically- and non-specifically defined task instructions), and topical knowledge. The topical knowledge was generated through the participants' self-reported responses on the search- knowledge of the subject. A closed-ended question was administered to understand the users' topical knowledge (see Kelly and Cool, 2002; Liu, Kim and Creel, 2013). Topical knowledge was set as a categorical independent variable in this study, hence the dichotomous yes-no response is appropriate to test for significant predictor.

Table 4 illustrates the summary of dependent variables and independent variables in relation to the research questions.

Table 4 *Dependent variables and Independent variables*

RQ/Hypotheses	Independent Variables	Dependent Variables
RQ1 Users' effort and hyperlinks	Websites	Hyperlink clicks Fixation durations Number of webpages visited
RQ2 Task specificity and users' effort	Task specificity Websites	Hyperlink clicks Fixation durations
RQ3 Task specificity (task difficulty and topical knowledge) and evaluation of websites	Topical knowledge Task specificity Task difficulty Websites	Credibility evaluation

Eye-tracking and Area of Interest (AOI) data collection

The eye-tracking tool allows for visualisation of gaze plots, heat maps or clusters representing the selected recordings of the media (Tobii, 2012). Besides the heat map and gaze plot visualizations, the software generates statistical data, metrics and charts that can be exported in excel spreadsheet.

To create the AOIs within a webpage, the objects are defined using AOI function tool. For example, the tool allows the selection of the specific elements such as the text, images, headers, categories, advertisements, to be predefined by drawing a rectangular box around the object (see Figure 4 for a sample illustration). The key elements are then grouped and with categorical names created. For example, if '*Rectangle 1*' is drawn for all headers in every webpage, '*Rectangle 1*' would be categorised as '*Headings*'. The eye-tracker software calculates all eye fixations and count metrics based on the defined AOIs. The mouse-click data can also be viewed from the information displayed at the side bar of the AOIs and Heat

Map. The statistical results are then exported in excel file for analysis (see sample metrics on Table 5)

Figure 4 Illustration of defining AOIs on a webpage

Table 5 Sample metrics of fixations durations and counts within the AOIs

	RECT 4			RECT 3			RECT 2			RECT 1		
	N(count)	M(sec)	Sum(sec)	N(count)	M(sec)	Sum(sec)	N(count)	M(sec)	Sum(sec)	N(count)	M(sec)	Sum(sec)
	Fixation Duration	Fixation Dur	Fixation D	Fixation D	Fixation D	Fixation D	Fixation D	Fixation D	Fixation D	Fixation D	Fixation D	Fixation D
	57	0.22	12.53	16	0.23	3.66	9	0.35	3.15	5	0.27	1.37
	51	0.28	14.26	27	0.3	8.06	23	0.46	10.49	51	0.38	19.27
...	14	0.25	3.51	15	0.3	4.45	3	0.61	1.83	76	0.4	30.78
	39	0.25	9.76	-	-	-	4	0.25	1	55	0.26	14.22
	31	0.22	6.86	7	0.22	1.55	8	0.21	1.72	24	0.33	7.81

The **operationalisations** of information foraging behaviour terms are explained below.

User effort in engaging hyperlinks: The number of mouse clicks activated by users on hyperlinks such as pictures, messages, icons, advertisement banners, and navigation to number of webpages through the link selections.

User effort in engaging information elements: The eye-fixation durations on the visual and text elements on webpages. Data were gathered through screen recording of eye-tracker software.

Web navigation: The navigation to the webpages are connected by hyperlinks. Hence web navigation is measured by the number of webpages visited.

Implicit and explicit cues. The data of implicit and explicit cues were derived from the qualitative analysis of the participants' interview responses. Through the first and second coding methods, these cues were identified. Implicit cue is expressed in users' predictive judgements, for example if they perceived the site as credible due to their previous knowledge or recommendation by others (Rieh, 2007). Users also engage in evaluative judgements on the explicit cues such as by expressing their preferences, for example to read reviews of others. Rieh (2007) refers to an individual's predictive judgement when he or she has prior knowledge of the system, structures, and evaluative judgements as externally-oriented, that is assessing the content, presentation style, and type of information object.

Questionnaire surveys

Upon completion of the online search tasks, participants were asked to fill in the questionnaire surveys. The objective of the survey is to gather the responses from the participants relating to their topical knowledge on the websites, for example, their perception on the quality and credibility, task difficulty, topic familiarity etc. of the information patches (websites or webpages). A brief summary of the survey questions is illustrated in Table 6. The detailed survey questionnaire is attached in Appendix C.

Table 6 *Summary of the survey questions*
(Details of the questionnaire attached in Appendix C)

<p>A. Personal particulars, e.g. age, gender, educational level, school</p> <p>B. Internet use – participants were asked to indicate or rate items such as:</p>   - indicate the social media sites that they are using e.g. blogs, Facebook, Twitter, Instagram, others - frequency of internet and social media use - bookmark or share information <p>C. Perception of using web links and cues
 e.g. if they click hyperlinks or use URL to navigate to other webpages</p> <p>D. Reasons for use of weblinks</p> <p>E. Reasons for trusting the quality of webpages and its information</p> <p>F. Reasons for trusting the value of webpages and its information</p> |
|--|

The semi-structured post-searched interviews were developed to examine the variables relating to topical knowledge (familiarity with the related topics), evaluative judgement identified as the characteristics of information foraging behaviour. A brief interview questions are appended in Table 7 (details are attached in Appendix E). The interviews were administered to ensure a level of consistency (Bryman, 2008) in accounting for the visualisation and survey data, and in understanding the individual's insights, meanings, themes and patterns, to uncover a thick description (Denzin, 1989) of the users' information seeking behaviour. It is with the hope that the interview process will engage the participants in a meaningful inquiry into his or her cognitive information processing. Interviews, observations and documents are considered the common sources of qualitative data (Patton, 2002).

Table 7 *Brief interview questions (see Appendix E for details)*

<p><i>Task</i></p> <ul style="list-style-type: none"> • Rate the level of difficulty, 1-7, 'least difficult' to 'most difficult' in these information search tasks. Explain why. • Have you searched for this topic before <p><i>Information search</i></p> <ul style="list-style-type: none"> • What are the criteria you look for when selecting certain websites for your information search? • Why did you click/not click on the web links? • Do you believe in the information retrieved from the source? Why? <p><i>Credibility evaluation</i></p> <ul style="list-style-type: none"> • Rate the credibility, 1-7, least to best, based on quality and value of the information (travel and food websites) • Explain how would you judge the 1) quality 2) value 3) relevance of the information
--

The participants spent an average of about 1 hour 15 minutes to complete the study. The durations of experiment included signing the consent form, taking eye-calibration, completing two Internet search tasks, responding to post-experiment interviews and filling in the questionnaire surveys.

Qualitative content analysis and coding

This qualitative content analysis was employed to analyse the semi-structured interview transcripts. For the consistency and validity of the study, triangulation of the data from the interview responses was measured through the quantitative and qualitative content analysis. The study employed the factorial design and the data analysis were derived from the correlations, and the coding of participants' responses. This mixed methods approach is necessary to achieve a holistic examination of information seeking and foraging behaviour, using statistical and qualitative content analysis.

To understand users' perceived level information credibility based on the quality of information cues and patch, the participants were asked to rate on the Likert scale of 1-7, from

‘1’ least to ‘7’ being most (high) on the level information credibility on the travel and the food blogger’s information patches. The credibility measurement was adopted from Sundar, Knoblock-Westerwick and Hastall (2007) questionnaire, and modified from a 10-point scale to a 7-point scale. Some scholars (Nunnally, 1978; Sauro and Dumas, 2009) have suggested that higher scale set options are likely to produce diminishing returns. As this is a post-task questionnaire, the common 7-point scale set can adequately achieve reliability, and this scale makes it easy for participants to respond to the questions (Sauro and Dumas, 2009).

Coding. According to Lewins, Taylor and Gibbs (2005), the things that can be coded are behaviours, events, activities, strategies, states, meanings and participations. Based on the concepts of information foraging and credibility theories, categorisations and numerical codes were established to examine strong and weak information cues and typologies of perceived level of credibility. Besides the *a priori* categorisation approach, themes, concepts, and ideas were further developed as it emerged from the documents (Suter, 2013).

An iterative method of manual coding was performed to ensure the refinement of the themes (e.g. Suter, 2012). The coding process involved opening coding (Lofland & Lofland, 1995), that is code or label words and phrases in articles and comments, followed by axial coding, which refers to creating themes or categories by grouping codes or labels given to words and phrases. Concepts can be attached to the categories, by linking and integrating abstract concepts, creating theory from emerging themes, and writing an understanding (Suter, 2012). Markham (2005) and Stienmetz (2012) suggested that a deeper coding through discourse analysis such as online content should include reading the text, languages, visual images (signs, symbols, etc.) as cues present itself in the online environment.

For the qualitative analysis, coding of data was applied, that is by assigning labels, meanings to chunks of data. Codes assigned to the data can be straightforward, descriptive label or evocative one such as metaphor (Miles, Huberman, Saldana, 2014). The data can be

taken ‘from interview transcripts, participant observations field notes, journals, documents, drawings, artefacts, photographs, video, Internet sites, e-mail correspondence, literature, and others.’ (Saldana, 2013, p. 3).

First cycle coding

In the first cycle coding, this study applied a combination of coding methods, that included descriptive coding, In Vivo coding, causation coding, magnitude coding (Miles, Huberman, Saldana, 2014). Saldana (2013) suggested that researchers do not need to rely on one approach to conduct the coding, and a mixed and matched coding method can be used to serve the particular function or purpose of the study.

The coding definitions provided by these authors (Miles, Huberman, Saldana 2014, p. 74-80; Saldana, 2013) are appended below.

Descriptive coding – assigns labels to data to summarise in a word or short phrase. It prepares for collating a list of topics for indexing and categorising.

In Vivo coding – uses words or short phrases from the participant’s own words or language (Miles, Huberman, Saldana 2014, p. 74). Repetitive or regular phrases expressed by the participants are good leads, and indicate some form of regularities and patterns.

Causation coding – extracts ‘attributions or causal beliefs ‘from the data (Miles, Huberman, Saldana 2014, p. 79). Antecedent and mediating variables are identified that lead to certain directions. A three-part sequence can be mapped, e.g. Code 1 > Code 2 > Code 3. It provides insight to look for causes, conditions, contexts, and consequences.

Magnitude coding – include ‘supplemental alphanumeric or symbolic codes or sub-codes applied to existing coded data or a category to indicate their intensity, frequency, direction, presence, or evaluative content. Magnitude codes can be qualitative, quantitative, and/or nominal indicators to enhance description. (Miles, Huberman, Saldana 2014, p. 80). Table 8 illustrates an example of the first cycle coding methods.

Table 8 *An example of first cycle coding*

Interview data	First cycle coding
<p><i>The travel site is credible source. People know LP for travel information, from books to website</i></p>	<p>Source credibility > others' reference > specialised domain > publications [causation coding and In Vivo coding]</p> <p>Reference [descriptive coding] Trust [descriptive coding]</p> <p>+ = positive [magnitude coding, '+' positive, '- 'negative]]</p>
<p><i>Food Blog site - the personal experience from the blog makes it more credible.</i></p>	<p>Personal experience > blog > credibility [causation coding and In Vivo coding]</p> <p>+ (positive) [magnitude coding]</p> <p>Source and personal blog [descriptive]</p>
<p><i>I have never tried their recommendations before, so not sure if I trust it. I have never heard of this blogger before, 'shady', and don't know if I can trust it.</i></p>	<p>Unknown > uncertainty > non-trusting [causation coding]</p> <p>No prior involvement [descriptive code]</p> <p>Unknown. Sceptical [descriptive coding]</p> <p>- (negative) [magnitude coding] -</p>

Second cycle coding

The second cycle coding involves patterning the codes from the first cycle coding. Categories, causes explanation, relationships and theoretical constructs are some classifications of pattern codes (Miles, Huberman and Saldana, 2014, Saldana, 2013)

Details of the coding with the final themes identified will be explained in the Findings section.

Two coders were recruited and trained to conduct the coding from the interview transcripts. The independent coders were deployed to code the interview data to eliminate biasedness in the data analysis. Intercoder reliability is an important component to ascertain

the objectivity of the interpretation of messages in content analysis (Lombard, Synder-Duch and Bracken, 2010; Neuendorf, 2002), as well as to maintain a standard measure of research quality (Kolbe and Burnett, 1991).

One coder is a second-year undergraduate and the second coder is a polytechnic graduate and working in a public institution. Both coders attended the briefing and training of the coding procedure conducted over three hours. The researcher explained to the coders, items by items, in which categories and values are to be assigned. To ensure that they have understood the instructions and process, a test-run was conducted. Each coder was given random samples of ten interview transcripts to apply the initial coding of the responses expressed on the travel and food blog websites. The instructions and coding sheet for identification of comments on information cues were provided for the coders (Appendix E). For example, '0' was assigned to negative comments (i.e. indicating weak information cues) and '1' was assigned to positive comments (strong information cues) on the travel and food blog sites. Inter-coding incorporated the categorisations of the overall comments pertaining to the information search. It is pertinent to conduct the content analysis in its entirety, as suggested by Hyener (1985) to provide a meaningful whole in deciphering the unit of analysis in interviews. Appendix E illustrates a sample of the coding and application of concepts and themes.

This reliability measurement was adapted from the Cohen's kappa (k) formula as this method is suitable for comparison of two coders' agreements (McHugh, 2012). Besides considering the percentage agreement, Cohen's kappa factors in the value of by-chance agreement.

The ten interview scripts were randomly selected for the initial encoding, and the first round of inter-coder reliability agreement was 60%. The researcher addressed any conflicting views and sorted unclear variables with the coders. Emerging themes and ideas that were

identified during the discussion with the coders, and new variables were added to the coding sheets. For example, a category ‘appropriateness’ was included to encode participants’ comments on whether the information and content were useful or relevant to meet the task instructions. The two coders continued to encode the rest of the transcripts, and the reliability agreement were computed on the indices based on Cohen’s Kappa(k) formula. The inter-coders took 7 days to complete the coding of a total of randomised 114 interview transcripts. The final inter-coder agreement for the comments on travel website was 82%, and 80% for the food blog site. 80% agreement was considered an acceptable minimum interrater agreement measure (Cohen, 1960; Neuendorf, 2002; McHugh, 2012).

Chapter Summary

This chapter describes the research methodology framework, research gaps, followed by addressing the research questions and hypotheses. The salient concepts of user effort, hyperlinks, task specificity and information evaluation based on the information seeking theory provide the backdrop for this research. The details of the research design, procedure, pilot study, measures through quantitative and qualitative content analysis were explained. Measures were described. The research method involves eye-tracking approach in analysing fixations and web navigations. Data from the eye-tracking records incorporate the heatmaps, areas of interest, and mouse-clicks analysis. Cohen’s Kappa reliability measurement was used to measure inter-coder reliability of the qualitative content analysis.

CHAPTER 5

FINDINGS

This section discusses the findings of the study of the hyperlinks and cues in affecting users' effort and the evaluation of websites. The experimental study incorporated the analysis of users' visualisation and mouse-click data generated through the eye-tracking tool. Parallel to Velayathan and Yamada (2007)'s work, the users' behaviour of evaluating information value was captured through gathering logs of their information search activities. An individual's navigational behaviour is expressed through his or her preference of information search and webpages selections, as discussed in the previous chapters. According to Blackmon (2012), understanding the cognitive web navigation behaviour is salient in determining the accuracy and predictions of the level of task difficulty and usability issues. Cognitive information behaviour is expressed in the participants' predictive and evaluative assessments during information retrieval and processing, as discussed in the literature review in the preceding sections.

RQ1 : How do hyperlinks affect users' effort in information seeking?

RQ2 : How does task specificity affect users' effort in information seeking?

To investigate the users' effort in information seeking on the websites, this study enlists the eye-tracker transaction log of link clicks, the duration of fixations, questionnaires and interviews. The hyperlinks are generated by the owner or source of the website to facilitate users' information retrieval and navigation within the webpages. Past studies measured the user effort based on link clicks, documents viewed or read, scrolling (Belkin and Muresan, 2004), query construction (Gerwe and Viles, 2000) and dual-task performance and self-report

(Rieh, Kim and Markey, 2012). These authors suggested that data collected from multiple sources were effective to assess mental effort in online searching (Rieh et al. 2012, p. 1136). Task specificity is manipulated through the two task instructions, specifically-defined and non-specifically defined tasks. The level of difficulty is embedded within the task instructions.

The experimental control is conducive in analysing information seeking behaviour on websites and navigation behaviour relating to the external stimulus that ‘information cue-drives link selection’ (Blackmon, 2012, p. 2).

The screenshots of mouse-clicks are shown in Figure 5(A). Overall, users’ link-clicks count analysis reflected a total of 319 clicks on Food webpages and 482 clicks on Travel webpages, Figure 5(B).

(A)

(B)

Figure 5 Screenshots of mouse-click on 'Read More' link located below the food website - Food webpage (A) and header link of Travel webpage (B) – partial webpages

To address RQ1 on the user effort in engaging the hyperlinks, the repeated measures ANOVA was performed to examine the effects of hyperlink clicks on travel and food websites, and task factor.

The dependent variable is the hyperlink clicks and the independent variables are the two websites, and task specificity. The within-subjects factor is the websites, with seven levels of hyperlinks, *'readmore', image, text, olderpost, headers, categories, and advert* hyperlinks. The between-subjects factor is the task specificity, with two levels, i.e. *non-specific and specific tasks*.

The repeated measures ANOVA shows the Mauchly's test of Sphericity where $p < .05$, hence Sphericity does not hold (Howell, 2002; Field, 2013). The Greenhouse-Geisser correction was applied.

The repeated measures results showed a significant effect in clicks (Food) and task, $F = 26.73$, $p < .001$ (Appendix F), and Travel website, $F = 68.57$, $p < .001$ (See Appendix G). Post-hoc comparisons using Bonferroni corrected paired samples t-tests ($p = .024$) revealed a significant mean clicks between the comparison pairs of *'readmore', image, text, olderpost and headers*, $p < .001$ (see Table 10).

For the **travel website** search, link-clicks data indicated that the *images, headers and text-hyperlinks* were used more (Table 9). The hyperlink interactions on both websites appear to reduce the user effort in guiding their information search and navigation. Image clicks on the **Travel** website were higher ($M = -1.49$, $SD = 1.89$, $p < .001$). It can be explained that the text information attached along with the picture on the travel site offers an added value to the interpretation of the pictures. It supplements the users' choice for looking for more information relevant to their task specificity. According to Hamid, Thom and Iskandar (2017) images are classified as objects that aim to attract users' attention.

For search on the **food website**, users engaged strongly in the *headers, categorical and 'read more'* hyperlinks (Table 9). There was active use of *categories* link on both travel and food websites, with mean categories link = .14 ($p = .157$). Users' effort imply their choice of link-selections. The labels included in the categories links provide a clue to the users in aiding them to make a choice to read the information on another page. The selection of these links aid in filtering information, thus lowering their effort in information seeking.

There was an absence of or scarce activation of advertisement links ($p = .319$). Users perceived that advert has no value or it poses a 'danger' and constraint in clicking on the link to pursue further information. As reflected in the interview responses, the participants perceived the cost of following the advert link to be high, due to the uncertainty of the content and risk of harmful element such as computer virus, that prevented them from engaging the links.

Table 9 *Descriptive statistics of hyperlink selections on travel and food websites*

Between subjects factor	Type of hyperlink	Within subjects factor	
		Travel	Food
Specific task	All category	Avg no. of clicks (SD)	Avg no. of clicks (SD)
	'Read more'	.01 (.11)	.25 (.53)
	Images	1.47 (1.88)	.24 (.62)
	Text	.55 (.94)	.00 (.00)
	Headers	.93 (1.03)	.35 (.64)
	Categories	.29 (.70)	.50 (.84)
	'Older-newer post'	.00 (.00)	.24 (.62)
	Advertisement	.00 (.00)	.00 (.00)
Non-specific task	All category		
	'Read more'	.06 (.24)	.59 (.85)
	Images	1.74 (1.70)	.00 (.00)
	Text	.44 (.77)	.00 (.00)
	Headers	1.09 (1.16)	.94 (1.31)
	Categories	.70 (.96)	.78 (1.29)
	'Older-newer post'	.00 (.00)	.28 (.66)
	Advertisement	.00 (.00)	.01 (.11)

--	--	--	--

Table 10 *Post Hoc paired sampled test of hyperlinks – Clicks and Websites (within-subjects) and Task specificity (between-subjects)*

Paired Samples Test					
Within Subjects : Clicks and Websites		Mean (SD)	<i>t</i>	<i>df</i>	<i>p</i>
Pair 1	Readmore clicks_Food - Readmore clicks_Travel	.38 (.75)	6.42	16	.000
Pair 2	Image clicks_Food - Image clicks_Travel	-1.49 (1.89)	-9.96	16	.000
Pair 3	Textclicks_Food – Text clicks_Travel	-.49 (.86)	-7.25	16	.000
Pair 4	Oldernews clicks_Food - Olderpost clicks_Travel	.26 (.64)	5.09	16	.000
Pair 5	Headers clicks_Food - Header clicks_Travel	-.36 (1.56)	-2.96	16	.004
Pair 6	Categories clicks_Food - Categories click_Travel	.144 (1.28)	1.42	16	.157
Pair 7	Advert clicks_Food – Advert clicks_Travel	.01 (.08)	1.00	16	.319
* Each comparison (t-test) was tested at a Bonferroni corrected significance level of $p = 0.238$ (.05/21), based on the formula for the 7 levels, $7 \times (7-1)/2 = 21$.					
Between subjects : Clicks and Task specificity		Mean (SD)	<i>t</i>	<i>df</i>	<i>p</i>
Pair 1	Readmore clicks_Food - Task type	-1.08 (.97)	-14.08	16	.000
Pair 2	Readmore clicks_Travel - Task type	-1.46 (.56)	-33.06	16	.000
Pair 3	Image clicks_Food - Task type	-1.38 (.58)	-30.05	16	.000
Pair 4	Image clicks_Travel - Task type	.11 (1.90)	.71	16	.479
Pair 5	Text clicks_Food - Task type	-1.50 (.50)	-37.83	16	.000
Pair 6	Text clicks_Travel	-1.01 (.97)	-13.15	16	.000

	- Task type				
Pair 7	Olderpost clicks_Food - Task type	-1.24 (.82)	-19.13	16	.000
Pair 8	Olderpost clicks_Travel - Task type	-1.50 (.50)	-37.83	16	.000
Pair 9	Header clicks_Food - Task type	-.86 (1.30)	-8.35	16	.000
Pair 10	Header clicks_Travel - Task type	-.49 (1.24)	-5.04	16	.000
Pair 11	Categories clicks_Food - Task type	-.86 (1.26)	-8.65	16	.000
Pair 12	Categories clicks_Travel - Task type	-1.01 (1.10)	-11.61	16	.000
Pair 13	Advert clicks_Food - Task type	-1.49 (.51)	-36.77	16	.000
Pair 14	Advert clicks_Travel - Task type	-1.50 (.50)	-37.83	16	.000

* Each comparison (t-test) was tested at a Bonferroni corrected significance level of $p = 0.000$ (.05/182), based on the formula for the 14 levels, $14 \times (14-1)/2 = 182$.

Figure 6 *Hyperlink selections of the Travel (N = 160) and Food websites (N = 160)*

The results revealed that prominent hyperlinks located on different web environment give different trails (McCart, Pandmanabhan and Berndt, 2013) to induce users to respond to the stimuli and aid navigation to other webpages. Users' swift navigations to the other webpages is contingent on their perceived value of the information cues present on the current site. The engagement of the hyperlinks lies in the meaning and clue interpreted by the users.

During information seeking, users typically engage in parallel overlapping search activities (Marchionini, 2006). The multiple search activities occur where users would scan the webpage, skim on specific information, read or view visual objects. The average number of 1-2 clicks on different links, and the short average fixation durations between 1 and 17 seconds on an item is illustrated in Table 13a, present the findings which demonstrate the users' skimming and scanning information techniques. This result is consistent with past studies on users' effort spent on web information seeking and site visitation, demonstrated that the majority of the users viewed only a few items on the webpage during a visit to the website. According to Nicholar, Huntinghon, Jamali and Dobrowolski (2007), people typically viewed three or fewer items before leaving a webpage. Another study (Lindgaard, Fernandes, Dudek and Brown, 2006) reported that users generally take 5 seconds to make an information decision on a webpage.

Depending on the quality and relevancy of the content, the hyperlinks create cue-following for users to move across multiple webpages. The findings are indicative of the effort invested by the users who perceived the value or cost of interacting with the hyperlinks and information cues.

The hyperlinks on the travel site are delivered in the form of image, headers, text, and categories links to help expand users' information searches and facilitate the navigational tasks. On the food site, participants were drawn to the headers, categories, and '*read more*'

hyperlinks, with the scarcity of image links activation. These findings demonstrate that cues play an important role in prompting users' action where they adopt the filtering techniques to maximise the return of their search.

Table 11 gives a summary of the integrated quantitative and qualitative analysis of users' engagement of hyperlinks and information cues.

Table 11 *Summary - integrated quantitative and qualitative analyses*

Description	Quantitative	Descriptions
User effort in engaging the hyperlinks	Image link $p < .001$ Text link $p < .001$ 'Readmore' link $p < .001$ Headers link $p = .004$ Categories link $p = .157$ 'Older-newer' post $p < .001$ Advert link $p = .319$	Strong cue from hyperlinks <i>Travel website</i> <i>Images, headers, and text-links</i> Food Blog website <i>Headers, categories, 'read-on' links</i> <i>Categories links</i> – There is no significant effect of the means of categories link clicks on travel and food websites. Weak information cue from hyperlinks - <i>Advertisement links</i> - with scarce or zero link clicks - <i>Image links</i> (Food website) – reported low clicks compared to travel site
Qualitative analysis		
Theme	Descriptions	Participants' responses
Semantics	The meaning in the text, and words that interest users, capture their attention.	'..based on writing, something that intrigues me..' (P008) '..categories link..words are interesting' ((P036)
Resonance	Links and cues that attract users, and resonate with personal interest	'Aquarium and water images – will click – I like 'water', will click on blue' (P020)

Filtering through hyperlinks	Techniques such as filtering and sorting information Exploring more information	<i>'..categories, top ten' (043)</i> <i>'I want to search for reviews for seafood, for review links' (P042)</i> <i>'a lot of articles, categories link help to filter (information)..'</i> (P034) <i>'..to look for specific information.'</i> IP055) <i>'I want to see if there are more information on another page. If things on the list are more interesting, so next link must be equally interesting' (P070)</i>
Level of expectation	Information that meet users' expectation	<i>The ones that I think it's useful, I want to explore it. (It) match my expectation...'</i> (P004)
Task relatedness	Searched information related to task	<i>'it relates to what I'm looking for' (054)</i> <i>'It is not related, not what I'm looking for' (P004)</i> <i>'Not useful, irrelevant, too messy, too much time incurred. (P043)</i> <i>'Not related to search..' (P041)</i>
Caution	Express fear, uncertainty, information cue that is doubtful of not clicking on links	<i>'Advertisement is dubious.'</i> (P036) <i>'I will focus on the page, don't know where the advertisement will lead to...lousier content' (P127)</i> <i>'Advertisement may have virus' (P019)</i>
Emotion	Express annoyance, anger, enjoyment of information cue of hyperlinks	<i>'Annoying..advertisement 'insert into my text makes me angry.'</i> (P138). <i>'Advert, pop-ups are not relevant and obstruct my browsing.'</i> (P129) <i>'images that are more attractive' (P007)</i> <i>'food images look delicious..' (020)</i> <i>Travel - 'images like landscape photo, national park.'</i> (P004)

Task specificity and engagement of hyperlinks

In addition to examining hyperlinks and user effort, this study is interested to understand whether task specificity has an effect on hyperlink interactions. Different task instructions were set up under specific and non-specific task conditions, to investigate task influence in information seeking.

As reviewed in the Chapter 2, it is important to consider task variables in the context of information seeking. Users adopt different strategies (Pirolli and Card, 1999) relevant to their search task to access information in the varied environments. The priority and clarity of the task determines users' choice of search strategies and assessment of information.

Specifically, the research question intended to address:

RQ2 : How does task specificity affect users' effort in information seeking?

Task and users' effort in hyperlinks

Table 9 reported the descriptive statistics of task specificity and the hyperlink clicks on the travel and food websites. A repeated measures of ANOVA was performed, and the Greenhouse-Geisser correction analysis indicated a significant mean difference of clicks, $F(1, 13.68) = 60.05, p < .001$. Findings showed the significant interactions between clicks and task, $F(1, 9.13) = 2.62, p < .001$.

Post-Hoc on clicks and task specificity

The paired comparison tests reflected the statistical significance in clicks on the websites and task specificity, except for the image hyperlinks on **travel site**. Overall, the *non-specific task* group engaged in higher link clicks (e.g. images, headers, categories) than the specific task group. (Figure 7). This indicates that when task is specific, user invested more effort in concentration on the current site through longer fixation, than reducing effort through hyperlink interactions.

However, when a message is attached to an **image**, both task group on the Travel site users engaged in the hyperlinks more ($M = 0.26, SD = 2.50, p = .351$), implying these hyperlinks help in reducing their effort in navigation.

Non-specifically defined task

On both travel and food web sites, users engaged strongly on the **headers and categories** links when conducting *non-specific task* as compared on specific search task. Similarly, users were more active in categories link-clicks given the non-specifically defined task instructions. The t-test results showed the significant difference in clicks and website. For **Travel** website, *headers* clicks, $t(-5.04)$, $M = -.49$, $SD = 1.24$, $p < .001$; *categories* clicks, $t(-11.61)$, $M = -1.01$, $SD = 1.10$, $p < .001$. For **Food** website, *headers* clicks, $t(-8.35)$, $M = -.86$, $SD = 1.30$, $p < .001$; *categories* clicks, $t(-8.65)$, $M = -.86$, $SD = 1.25$, $p < .001$. (Appendix J)

This finding indicated that as the task instructions are broad, users rely on cues from the headers and categories hyperlinks to guide their search. When the task instructions are less specific, effort was expended in navigation through the aid of hyperlinks, and less concentration on current webpage. Users perceived the task to be ‘easy’ as indicated by their responses during the interview.

Specifically-defined task

When conducting *specifically-defined* task, users interacted in **text clicks** higher than the *non-specifically-defined* task. **Food** ($M = -1.50$, $SD = .50$, $p < .001$), **Travel** ($M = -1.01$, $SD = .97$, $p < .001$). Similarly, in *specifically defined task* group of food search, participants’ engagement of the headers links was significantly lower.

Given the *specific task* instructions with specific descriptions, it appears that users focus on the text hyperlinks for clues and engage less in hyperlinks. When the task is specific, the users’ concentration on the text element is higher, exhibited through the longer fixations on webpage than navigating away to another page. User effort invested in concentrating on the current page and users narrated that the task is ‘difficult with more information to search’.

Figure 7 *Hyperlink clicks by task specificity (Specific and Non-Specific tasks) – Travel and Food websites*

Task and navigation

A repeated measures ANOVA was performed to analyse the navigation behaviour to the different websites and task factor. It is important to understand the information seeking and web navigation behaviour. The Greenhouse-Geisser correction analysis indicated a significant mean difference of website visited, $F(1, 648) = 36.50, p < .001$. Findings showed a mild significant interaction between websites and navigation (webpages visited), $F = 1.02, p = .013$. (Appendix L)

The results reflected the effect of task (*non-specific and specific groups*) and navigation activities (webpages visited) of the websites (travel and food websites). There was a significant main effect of task specificity and web navigations on both sites (measured by the number of webpages visited). The paired comparison analysis indicated that the participants spent a slightly longer time on the travel site, LP ($M = 1.73, SD = 1.73$) as compared to the

food website ($M = 1.64$, $SD = 1.35$). The *non-specific task* group navigated to more webpages as compared to the specific task group (*Non-specific*, $M = 6.40$, $SD = 3.24$; *Specific*, $M = 5.14$, $SD = 3.0$). (Table 12a). In the case of the non-specific task group, the task instructions given were broad, and the vague descriptions may contribute to the reason for this group minimising effort through moving across the webpages connected by hyperlinks. The variation in the information behaviour and task factors in this study is consistent with Frost, Taylor, Noakes, Markel, Torres, Drabenstott (2000)'s postulation that task descriptions influence user's adaptation of different strategies and techniques in information seeking.

Table 12a *Descriptive statistics of number of webpages visited – Travel and Food websites*

	Within subjects factor		
Between subjects factor	Travel	Food	Total webpages visited (M/SD)
Specific task	Average no. of webpages (SD) 5.14 (3.00)	Average no. of webpages (SD) 2.83 (2.01)	 7.97 (5.01)
Non-specific task	6.40 (3.24)	4.74 (3.02)	11.14 (6.26)

Table 12b *Post-hoc paired sampled test of number of webpages visited - Travel and Food websites and Task*

Paired Samples Test						
		Mean	SD	t	df	Sig. (2-tailed)
Pair 1	Webpages_Food_Specific - Webpages_Food_Non-specific	-1.91	3.71	-4.60	79	.000
Pair 2	Webpages_Food_Specific - Webpages_Travel_Specific	-2.31	3.36	-6.15	79	.000
Pair 3	Webpages_Food_Specific - Webpages_Travel_Non-specific	-3.58	3.77	-8.47	79	.000
Pair 4	Webpages_Food_Non-spec - Webpages_Travel_Specific	-.40	4.14	-.86	79	.391
Pair 5	Webpages_Food_Non-specific - Webpages_Travel_Non-specific	-1.66	4.65	-3.20	79	.002
Pair 6	Webpages_Travel_Specific - Webpages_Travel_Non-specific	-1.26	4.21	-2.68	79	.009

Time factor

Time appeared to have no effect on the link selections on the two websites, on visit to webpages, ($F(1, 316) = 1.03, p = .31$, partial $\eta^2 = .003$, and fixation durations, $F(1, 316) = 1.37, p = .24$, partial $\eta^2 = .004$). This is expected, as within the experimental setting, the participants focused on searching and completing the information task based on the instructions. The stipulated and non-stipulated time durations administered under the experimental condition, similarly pose time constraints for both travel and food topics search.

Fixation durations on information cues

The attentional focus on information cues denotes the participants' mental effort in reading and viewing the element through the fixations on the features such as visual objects, text, headers, categories or adverts on the webpages. Each of the visual elements such as headline captions (headers), textual content, images, advertisements, categorical links and other hyperlinks displayed on the webpages, were manually selected by drawing a rectangular box within the AOIs (see Figure 8). Similar features were grouped together and classified for statistical analysis. For example, the headline captions were grouped under "Header". The websites selected were stated in the task instructions, and the quantitative data of fixation durations on the AOI were generated from the eye-tracker record.

Users' attention on the information cues was measured by the fixation durations. The duration of fixations and web navigations relevant to the task specificity and websites are showed in Table 13a and 13b.

Figure 8. *An example of a selected Areas of Interest (AOIs) of the travel website (partial webpage)*

A repeated measures ANOVA on the effect of fixation durations on the travel and food websites was conducted. The dependent variable is the fixations durations and independent variable are the websites and task specificity. The within-subjects factor includes the two websites, with fixations at the 5 levels: *text, images, advert, categories and header*, and the between-subjects factor is the task specificity, *specific and non-specific*.

The Greenhouse-Geisser corrected analysis showed a significant difference of the main effect of **fixations**, for **Food** website, ($F(1, 31.25) = 40.34, p < .001$), and **Travel** website, ($F(1, 35.80) = 85.38, p < .001$) (Appendix H),

For the website fixations, participants conducting search on **food site** recorded a longer dwelling time than the travel site. The **travel** search in both task groups showed shorter fixation durations, but visited more webpages as reported.

Post-hoc test - Fixations and Websites

The interaction effect between fixations and websites is significant, ($F(1, 19.93) = 14.07, p < .001$). Post-hoc test using Bonferroni corrected paired samples analysis revealed a significant result of fixations and websites, $p < .001$. The paired comparisons were generated between fixations of both websites and each information cues : *text, images, advert, categories and header*. (Table 13b, Appendix K)

Overall, the users displayed more effort on search in fixations, on the food website, ($N = 160$), in text ($M = 4.54, SD = 7.43$), advert ($M = 2.90, SD = 3.26$), categories ($M = 6.50, SD = 9.82$) and header ($M = 2.21, SD = 8.09$). In the travel search, the duration of the fixation on the images ($M = -9.52, SD = 13.97$) was longer than on the food search. (Table 12a and 12b).

Table 13a *Descriptive statistics of fixation durations (sec) – Travel and Food websites*

Between subjects factor	Type of information cue	Within subjects factor	
		Travel	Food
Specific task	All	Average duration in secs (SD)	Average duration in secs (SD)
	Text	2.82 (3.30)	6.57 (6.86)
	Pictorial	16.52 (16.22)	2.84 (2.67)
	Header	6.36 (5.11)	5.00 (3.42)
	Categories	0.36 (1.19)	9.82 (11.27)
	Advert	0.74 (0.22)	3.74 (3.62)
Non-specific task	All		
	Text	2.70 (3.16)	8.03 (7.05)
	Pictorial	8.75 (8.35)	3.39 (3.84)
	Header	4.11 (3.54)	9.87 (7.13)
	Categories	0.46 (1.39)	4.00 (6.96)
	Advert	0.12 (0.43)	2.27 (2.63)

Table 13b *Post Hoc paired sampled test of fixation durations – Fixations and Websites (within-subjects) and Task specificity (between-subjects)*

Paired Samples Test						
Within-subjects		Mean	SD	t	df	Sig.(2-tailed)
Pair 1	Text_fixn_Food - Text_fixn_Travel	4.54	7.42	7.73	159	.000
Pair 2	Images_fixn_Food - Image_fixn_Travel	-9.52	13.97	-8.63	159	.000
Pair 3	Ad_fixn_Food - Ad_fixn_Travel	2.90	3.26	11.28	159	.000
Pair 4	Categories_fixn_Food - Categories_fixn_Travel	6.51	9.82	8.37	159	.000
Pair 5	Header_fixn_Food - Header_fixn_Travel	2.20	8.09	3.45	159	.001
Between-subjects : Task specificity						

Pair 1	Text_fixn_Food_Nonspecific – Text_fixn_Food_Spec	1.46	9.78	1.34	79	.185
Pair 2	Image_fixn_Food_Nonspecific - Image_fixn_Food_Spec	.55	4.46	1.10	79	.276
Pair 3	Advert_fixn_Food_Nonspecific - Advert_Food_Spec	-1.47	4.16	-3.16	79	.002
Pair 4	Categories_fixn_Food_Nonspecific - Categories_Food_Spec	-5.82	11.76	-4.43	79	.000
Pair 5	Header_fixn_Food_Nonspecific - Header_Food_Spec	4.87	7.27	5.99	79	.000
Pair 6	Text_fixn_Travel_Nonspecific - Text_Travel_Spec	-.12	4.57	-.24	79	.808
Pair 7	Image_fixn_Travel_Nonspecific - Image_Travel_Spec	-7.77	16.92	-4.11	79	.000
Pair 8	Advert_fixn_Travel_Nonspecific - Advert_Travel_Spec	.05	.49	.88	79	.383
Pair 9	Categories_fixn_Travel_Nonspecific - Categories_Travel_Spec	.11	1.66	.58	79	.561
Pair 10	Header_fixn_Travel_Nonspecific - Header_Travel_Spec	-2.25	6.47	-3.11	79	.003

Task specificity and information cues

A repeated measures of ANOVA was performed for task specificity and fixations. and the Greenhouse-Geisser corrected analysis showed a significant difference of the main effect of task specificity, $F(1, 32.44) = 14.22, p < .001$.

For **food search**, specific and non-specific task, the fixation durations in advert ($p = .002$), categories ($p < .000$), and header ($p < .000$).

Overall, the *specific task* group conducting travel and food search recorded higher fixation durations as compared to the non-specific task group.

Specific task group

For the travel search, in relation to task specificity, attention was focused on image ($p < .000$) and header ($p = .003$). The specific- task groups incurred longer time durations on the pictorial cues, travel webpages ($M = 16.52$, $SD = 16.22$) as compared to the non-specific task group ($M = 8.75$, $SD = 8.35$) of the same travel website (Figure 9). For specific-task group on travel search, overall 65% fixated on the pictures beyond 10 seconds with 23% between 20 – 100 seconds, compared to non-specific task group, with 21% fixated beyond 10 seconds.

Non-specific task group

Users spent a longer fixation duration on the **Food** website, (*non-specific* task, $M=5.88$, specific task, $M = 6.44$) than the **Travel** website (*non-specific*, $M = 2.86$, specific, $M = 4.38$).

The results indicated that task specificity potentially shaped users' effort in information seeking. Users' attention on information cues appeared to be determinant on the nature of task instructions. On one hand users of the *non-specific* task group tended to explore more webpages, indicative of rapid scanning of content. On the other hand, the *specific task* group exhibited low involvement of hyperlink clicks. The lower link clicks behaviour reported demonstrates more effort with the higher attentional focus on content. This information behaviour suggested a task-oriented information processing. The link selections and cue fixations, indicative of the varied effort applied based on the characteristics of the task.

Figure 9 *Fixation durations of information cues - Task specificity and websites*
LP – Travel website FB – Food website

The link-click data that was reported in the preceding section demonstrated that the *specific task group*'s engagement of image hyperlinks was lower (see Table 8). The implication of the link clicks versus fixation durations suggested that given the *specific task* instructions, users were more task-focused in viewing and reading content. Conversely, the non-specific group searching for travel topic filter information through hyperlink selections.

There is strong visual engagement on the **image** content than text content on the travel website. On the travel webpages, the captions attached to the pictures produced some level of cue that enlisted the users to interact with the hyperlinks to lead them to visit more webpages. Conversely, on the food webpages, in the absence of a strong information cue from the image, users tended to divert their attention to the messages, headers and categories. This finding revealed that the web design influences a user's information seeking behaviour.

Categories cues. The findings indicated that given the specifically defined task instructions on food search topic, the specific task group showed stronger gaze interactions on the *categorical cues* ($M = 9.82, SD = 11.27$) as compared to non-specific task group ($M = 4.00, SD = 6.96$) of food topic search. While the specific group dwelled on categorical cues, it was observed that this group spent less time in reading the text content on food webpages, (specific task group: $M = 6.57, SD = 6.86$; and non-specific group, $M = 8.03, SD = 7.05$). The task instructions called for participants to seek for precise queries on cuisines and locations. With the clear task descriptions, participants adapted to focusing on categorical cues to guide their search topics.

Header cues. The non-specific task group ($M = 9.87, SD = 7.13$) recorded higher dwelling time than the specific group ($M = 5.00, SD = 3.42$). These findings indicated that users who conducted information task of general instructions were more actively scanning headline descriptions and text content on food webpages.

Advertisement cues. There was near zero engagement of advertisement cues displayed on the food website (Figure 10A). The low fixations and scant number of clicks on the advertisements of both travel and food websites suggested the weak information cues of these visual elements. It is of interest to observe that there was display of a clustered fixation effect, where the participants appeared to scan the elements as a whole, that is by viewing a group of information cues that are located within the visual view. The cues displayed within the inverted L- section (Figure 10B – the blue box within the AOI region) appear to produce no information cue. This means that there was an absence of link clicks and fixations on the panel of the page. The correlation between the advertisement and categories fixations was significant for the food website, $r(159) = .41, p < .001$, and the travel website, $r(159) = .57, p < .001$. The results suggested that the position of the visual elements influence fixations. That is, when users fixate on the advertisements on the top right panel, it was followed by

fixations on the categories located at the lower right panel. If there was no fixation on the advertisements on the top right panel, there would be scarce fixations on the categories links.

Figure 10(A) AOIs of advert and categories (Travel website)

Figure 10(B) AOIs of advert and categories (Food website)
inverted L-shaped AOI emit no or weak information cue

Figure 10 Areas of interest (AOI) of advert and categories – Travel and food websites

This section reports the results of the hyperlink selection, and effort invested on the different websites. As the web environments serve a myriad of visual and text elements to meet diverse information seeking goals, it is pertinent to understand users' information behaviour, such as their effort incurred in engaging the hyperlinks and visual elements and evaluation. This entails the examination of task specificity, link-click behaviours, and information evaluation. As reviewed, past studies have been scant in understanding how hyperlinks affect user effort in information seeking, and task specificity in the evaluation of information.

The findings in this study demonstrated that users do not merely respond to hyperlinks or visual elements displayed on the websites. Rather their preferences in clicking on the hyperlinks is contingent on the effort, task specificity and the aesthetic of the hyperlinks. Task specificity, *specifically-defined* and *non-specifically* defined instructions were administered in this study and comprised different sets of information search requirements. (Appendix B).

Overall, this study demonstrated that task specificity affects users' effort in hyperlink and web navigation. The *non-specific* group who conducted the travel and food search topics navigated to more webpages. The navigation behaviour implies users' reduced effort through swift scanning of the webpages aided by meaningful hyperlinks. Tasks with general, and sometimes ambiguous, instructions (*non-specific*), do not impose demands on users to seek for specific queries, and the task can be perceived as easier searches than task instructions with specific information.

Qualitative analysis

The qualitative results showed the association of task specificity, hyperlinks and evaluation. The *specific task group* exhibited more confidence to start the search but expressed information overload. This group also found it hard to make decision, relating to

the specific task requirements, task load, perceived inaccuracy of information and they tended to use filtering technique to narrow the search. However, the *non-specific task group* expressed that the information was easy to find with less restrictions. They expressed the need to find additional information and accepted general information but were uncertain about how to start the information search. (See Table 14)

Specifically-defined task group

As evident in the findings in RQ2 reported on chapter 5, when task specificity is high, users exert more effort on the current site, therefore there was low involvement of hyperlinks. In *specifically-defined task* where participants were instructed to look for exact information on three places of interest in ‘South Africa, culture and lifestyle, and read bloggers’ travel stories in Africa’, the fixations and dwelling time on the visual elements such as images, and headers lengthened, as compared to the *non-specific group*. As expected, users from the *specific group who conducted the travel search*, incurred effort through longer fixation time on the visual elements and low involvement in the hyperlink clicks. Similarly, this information behaviour was detected in the *specific group* of the food search topic, where the hyperlink clicks were lower on the headers, categories and the ‘read more’ hyperlinks.

The focus for specific information was due to the specific task instructions that called for participants to perform additional information searches which required more effort to complete the task. With specific information task instructions, the users were given clear criteria and scope of the search task. For example, participants were required to look for ‘seafood and vegetarian cuisines’, ‘seafood restaurant in the east and west zones’, and ‘vegetarian restaurants in the east and west zones’. From the qualitative results, the participants in the *specific task group* indicated the overload of information and they found it

difficult to make decisions with regard to the task stipulations. Table 14 illustrates the qualitative analysis of task specificity and website evaluation.

Table 14 *Qualitative analysis of the influence of task specificity (specific and non-specific) and website evaluation*

Theme	Specific Task group	Non-specific task group	Descriptions
Website, Information	<p>Overload of information and text Lack of facts</p> <p><i>e.g. 'typed in six cities, many (spelling) information' (P054) a lot of words (P084) 'information do not have a lot of facts' (P085)</i></p>	<p>Sufficient information – enough Availability of information</p> <p><i>e.g. 'searched before and a lot of websites..' (P082) '..a lot of information and suggestions available.' (P075) '..enough information on the internet.' (P087)</i></p> <p>Easy to find</p> <p><i>e.g. '..a lot of information and suggestions available.' (P075) '..internet makes it easy with keyword' (P69)</i></p>	<p>Specific task group Feel the information overload</p> <p>Non specific task</p> <ul style="list-style-type: none"> Exhibited more satisfaction with the sufficiency and availability of information. Information was perceived as easy to find
Task difficulty, Evaluation	<p>Difficult/hard decision – a lot of options</p> <p><i>e.g. 'have to decide which is in the East and which is in the West' (P081). '..a lot of options, cannot really choose.' (P052). 'food, a bit harder, both good and bad, don't know which to follow.' (P1150)</i></p>	<p>Knowledge</p> <p>Need to find new or other information (initiate)</p> <p>Need to consider other factors</p> <p><i>e.g. 'need to take into account price, hotel, safety;' (P082) '..need to read different sources..' (P125)</i></p>	<p>Specific task Demonstrated difficult decision making, filtering techniques, and perceived inaccuracy of information</p> <p>Non-specific task Initiated the need to find new information, consider other factors (due to the fact that task descriptions were general and broad)</p>

	Perceived inaccuracy of information	Accept general information <i>e.g. 'know little conception..accept every information' (P096)</i>	Readily accepted general information
	Filter techniques '..narrow the range,' (034)		
Task specificity	Specific requirements More information to search for (task load) <i>e.g. 'more information to search..' (P129)</i> Confidence to start search <i>e.g. '...I know what I'm looking for' (036)</i> <i>'..narrow the range, I know what I am looking for' (034)</i>	Broad scope Less restrictions General task Easy task Straightforward <i>e.g. 'can find information for these tasks, enough information on internet.' (P087)</i> Unsure of where to start looking for info <i>e.g. '...don't know where to start searching.' (P101)</i> <i>'..don't know where to look for information' (P035)</i> <i>'the task is straight forward' (P045)</i>	Specific task Specific requirements to carry out search task. Confidence to start search Task load Non-specific task Broad scope, feel there is less restriction, easy task Uncertainty in how to start search

This search pattern has implications on the way task instructions are stipulated. For instance, specific task descriptions allow for clear task-focus. A previous study on information seeking behaviour conducted by Jarvelin and Ingwersen (2000) suggested that the dimensions of information need such as well-defined and ill-defined instructions, alter users' search queries and their filtering of irrelevant information. If the information is well-defined, the cognitive state of the users will be characterised by a focused search (Ingwersen & Jarvelin, 2005). When the users experienced difficulty in identifying specific information, they tend to spend a longer time on the website, denoting more effort required. Prior studies (Brystrom,

2002; Aula, Khan and Guan, 2010) reported that when users encountered difficult search task, they would reformulate more queries and linger on the webpage.

Non-specifically defined task group

The findings on RQ2 reported on chapter 5 indicated that when task specificity is low, users exert less information seeking effort on a webpage and scan more webpages. Hence, users visited more web pages through involvement in hyperlinks, indicating reduced effort in information seeking.

Further, from the qualitative analysis on Table 14, the *non-specific task* group expressed that the task was easy and direct and they accepted the general information. Participants of the *non-specifically defined task* group tended to engage in the hyperlinks higher than the *specifically-defined task* group. For example, the *non-specific task* group tended to activate the *headers, categories and 'readmore'* hyperlinks, an indication of their responsiveness to the hyperlink cues. Although there was no significant difference in the image hyperlink clicks of both task groups of food topic search, the *non-specific task* group conducting the travel information search reported a higher number of hyperlink clicks than the *specific task group* of travel topic search. Without clearly defined task instructions, users may exhibit the behaviour of an 'everyday' information seekers, taking the approach of a browsing behaviour (Choi, 2010; Albertson, 2015).

Previous study (Goodrum, Bejune, & Siochi, 2003) on image search patterns suggested that the image element with text-based queries led to lengthier search times. Further, Choi and Rasmussen (2002) also proposed text content which was attached to an image was important for a relevant assessment. The findings in the qualitative analyses is aligned to the previous study (Goodrum, Bejune, & Siochi, 2003; Choi and Rasmussen, 2002) on the value of text embedment in the pictures that reduce user effort in search. Furthermore, the results revealed

that the task specificity has an impact on users' engagement with the hyperlinks and visual elements.

Hyperlinks and information cues

In relation to hyperlinks and visual elements, the findings on RQ1 (see chapter 5) revealed that users' involvement in the visual elements such as image hyperlinks on the travel website were high. Image cues convey different meanings to information users (Shatford-Layne, 1994). The cue is exhibited from the useful text captions that help users with the interpretation of the message from the image content. In this respect, relevant to the task instructions of looking for destination of South Africa, the expectation of 'seeing' the lifestyle and culture gave a gratifying search experience. Most participants expressed favourable feedback on having images to guide their search. As these participants articulated, what enticed them was the engagement of image hyperlinks, the curiosity to look for further information, and an enriching information seeking experience. For example, participant P182 commented that:

"...if I see that the picture is interesting, but the caption is not interesting, I will still click to find out more."

Another participant (P191) shared that *"...the photo gallery, the photo caption is informative...know what you expect to experience"*. The aesthetics of the hyperlinks with clear message appear to reduce the effort of the users in information seeking and web navigation.

Conversely, the scarcity of hyperlinks in the food website contributed to the weak information cue, thus led to users' lower engagement of image content. As a participant (P010) explained ~~that~~, *"...usually (for) images, I will hover over it if they link to (the) page"*, which means the intent to read or view further information and objects taking the cue from the image and hyperlink.

In this study, the time factor has no effect on the duration of fixations. It is expected in the computer laboratory setting where the experiment was conducted. Given the ten-minute timeframe, the participants of each task group would still experience time constraints.

Analysis from the eye-tracking logs reported some significant findings in that users engaged cues as a whole rather than as a single information cue. The AOI analysis sheds light on the clustering effect of fixation. For example, users adopted the reduction approach of filtering non-relevant element, particularly on the space with sponsored advertisements. When there was an absence of fixation on the advertisement located at the top right panel of the webpage, no fixation or engagement of the categories hyperlinks located below the pictorial cues was recorded. It is interesting to note that there was no fixation on the inverted L-region displayed on the webpage. From this examination of hyperlinks, it was observed that users' effort expended on the second cue depends on whether the first cue provides a strong clue. This hyperlink engagement is in line with Fu and Pirolli's postulation that the hyperlink selection depends on the position of the link on a web page (2007).

My study discovered that the cluster of related hyperlinks reduce users' effort in filtering information. Furthermore, the advertisement hyperlinks affect attention and effort because they were generally reflected as negative hyperlink by the participants in this study. The perception of irrelevancy, harmful (undesirable element of virus attached to the advertisement) and issue of objectivity were some reasons for the non-engagement of the hyperlinks, as expressed in the responses by the participants. The findings in my study were contrary to the study conducted by Kalyanaraman and Ivory (2009) that a picture attachment to a relevant advertisement generates strong clue and produced a positive attitude in the users. The current research demonstrated that the users are able to discriminate between value and cost to guide their effort in information seeking. If the information is perceived of value to the users, they

would click on the hyperlinks to pursue and explore more information. In contrast, if the information is perceived as a risk to their search, users would not engage in the hyperlinks.

Evaluations of websites

RQ3: How does task specificity affect users' evaluation of website?

This section has presented findings of the conditions of task specificity that includes topic knowledge and its effect on website evaluations. As discussed in the literature review (Chapter 2), human information behaviour encompasses a user's evaluation of the source (Rieh, 2002; Fink-Shamit & Bar-Ian, 2011, Wilson, 1983), and assessment of the quality of the visual elements displayed on the websites. Although the perceived authority of the source emanates as a strong clue to facilitate information retrieval, it is unclear if the source of a website aid web navigation. According to Petty, Rucker, Buzer and Cacioppo (2004) and Petty and Cacioppo (1986), when users lack the motivation and effort, they rely on the external features of the website for their information evaluation decisions.

In the online environments, these external features are visual elements such as images and text to attract users (Katz and Byrne, 2002), and guide web navigation decision (McCart, Padmanabhan and Berndt (2013). Factors such as task demand, prior search experiences and knowledge of the subject area may influence the criteria users adopt in appraising the quality, value or trustworthiness of information in the web environment. Understanding information users' topic proficiency and task demand may shed some light on their information credibility judgement. The objective of this experiment was to examine if task specificity that include task difficulty and topical knowledge influence information evaluation.

This section first presents the qualitative content analysis of the users' interpretation of strong and weak information clues, and the evaluation of the websites to address the research question. The categories and concepts of the characterisations of evaluation of websites were

adapted from the previous studies (see Hilligoss & Rieh, 2007; Metzger, Flanagin, Eyal, Lemus, & McCann, 2003; Self, 1996; Shon & Musen, 1999; Wathen and Burken, 2002). The additional themes were included from the qualitative data during coding of the interview comments. The study established the theme's categories such as information source familiarity, credibility, engagement of navigation links, perception of the aesthetical design of the website. The data were generated from the link-click analysis, fixation durations and qualitative content analysis of post-experiment interviews.

Through the deductive and inductive evaluations during the open and axial coding, the patterns and themes were identified on the users' credibility perception on the information cues. The present study classified the information clues to implicit and explicit cues, that were coded from the qualitative method.

As explained in the chapter 4, first and second cycle coding were applied in the qualitative analysis. The pattern coding is applied to group the summaries and condense them into categories, themes, or constructs. Pattern codes comprise categories or themes, causes/explanations, relationships among people and theoretical constructs. For example, in the first cycle coding, a number of initial codes was identified, and these codes were examined further for categories/themes, causes/explanations, relationships, theoretical constructs (Miles et al., 2014). Table 15 illustrates the examples of pattern coding.

Table 15 *An example of second-cycle coding of pattern codes*

Pattern codes	Descriptions	Interview data
Categories/themes	Positive feedback – strong information cue	<i>source credibility, credibility, others' references, domain, blogger's experience, published work, positive perception</i>
	Negative feedback – weak information cue	<i>no prior involvement, non-trusting, unknown site, uncertain, sceptical, negative perception</i>
Causes/explanation	Information cue affects the users' perception and judgement	<p>Strong information cue → Perception → trust, positive perception</p> <p>Weak information cue → Perception → non-trusting, negative perception</p>
Theoretical construct	Predictive judgement (implicit cue)	<i>source credibility, familiarity, author's experience, others' references</i>
	Evaluative judgement (explicit cue)	<i>reviews, objectivity of message, content,</i>

When the users experienced difficulty in identifying specific information, they tend to spend a longer duration on the website, denoting more effort required. Prior studies (Brystrom, 2002; Aula, Khan and Guan, 2010) reported that when users encountered difficult search task, they would reformulate more queries and linger on the webpage.

From the qualitative analysis, themes emerge from the strong and weak cues are aesthetic, hyperlinks, image and text content, credibility perception of source and content.

Table 16 provides the categorisations of information clues encoded from the participants' post-interview responses. Strong information clues were encoded from the positive comments and weak information clues were coded from the negative comments from the participants. Magnitude coding using numeric was employed to adhere to the consistency and objectivity of the analysis. '0' was assigned to the negative feedback that reflects weak information cues, and '1' was assigned to the positive feedback that relates to strong information cues. For example, comments such as '*...the interface is messy*' that implies negative comments was given a '0'. Comments such as '*...there are reviewers.*' which signifies positive feedback due to the preference as indicated by the participants, was assigned a '1'. (See Appendix E for details of the coding information).

The data showed that strong information clues were accorded to the aesthetical layout, familiarity and popularity of the travel website in which the level of credibility and trustworthiness were also expressed positively. On the contrary, these elements showed up as weak information clues as on the food website.

Table 16: *Categorisations of strong and weak information cues present in the Travel and Food websites.*

+ denotes strong information cue - denotes weak information cue

	Travel website (LP) Information cue			Food blog website (FB) Information cue		
Information cue	<i>Positive</i>	<i>Negative</i>	<i>Overall (Strong/ weak cues)</i>	<i>Positive</i>	<i>Negative</i>	<i>Overall (Strong/ weak cues)</i>
Aesthetic	6.52%	5.00%	+	1.67%	21.11%	-
Pictorial	3.62%	2.90%	+	1.11%	2.22%	-
Text/reading ease	3.62%	1.45%	+	0	9.44%	-
Hyperlinks	2.00%	0%	+	0.56%	0.56%	Neutral
Appropriateness	10.87%	10.00%	+	5.56%	19.44%	-
Language/writing style	0.72%	0.72%	Neutral	1.67%	0.56%	+
Trustworthy	4.00%	2.90%	+	0.56%	5.56%	-
Advertisement	0.72%	1.00%	-	0	1.11%	-
Reviewers	0.72%	0.72%	Neutral	1.67%	3.33%	-
Authorship						
Familiarity	9.42%	1.00%	+	0	8.89%	-
Expertise	2.90%	1.00%	+	0	4.44%	-
Popularity	13.00%	0.70%	+	0.56%	2.22%	-
Credibility	10.87%	4.35%	+	1.11%	6.67%	-
	100%			100%		

Information clues are often derived from the hyperlinks, visual and text objects in which they convey meanings to attract users' responses to these elements. Conversely, information

users' intention to engage the hyperlinks and visual elements depend on their effort and interpretation of the content. Prior topic knowledge, according to Rieh (2002) denotes the predictive judgement to guide a users' initial search queries.

The following discussed the themes derived from the responses of the participants relating to strong and weak information clue on the websites.

Strong information clue

Authorship credibility. Users rely on the prior knowledge of the source in information seeking. According to Sundar, Knobloch-Westerwick and Hastall (2007), users tend to evaluate information credibility, such as the quality and reliability of the source and content, stronger than information recency. Users' perception of the authors were elicited from the various sources such as referees, popularity, personal knowledge and experience, or the source's specialisation. For example, the participants' comments relating to these factors were:

On Travel website. "...The travel site is credible source. People know Lonely Planet for travel information, from books to website..." (P178).

On Food website "... the personal experience from the blog makes it more credible.

Referee credibility. Besides relating to personal experience, participants tend to take the cue from others' references and for the assurance to use the website, as the following participants commented:

"...I will look at the source providing the information – if they are from the industry (P047). Lonely Planet is credible, people know the website for travel information, from book to website..." (P027)

Another participant put it that information needs to be from the governmental institutions, expressed as *"....government website and it is peer-reviewed."* (P050)

Reviews and objectivity credibility. The homogeneity of positive reviews by others contribute to the strong information cues. Participants reduce their effort in information seeking by leveraging on similar reviews of other users. For example, a participant expressed that he would compare reviews to ascertain if most readers expressed similar opinions.

Comparison of reviews. “...most readers share the same reviews...” (P022)

“...It is trustworthy and (it’s) an official website, with the reviews...” (P008)

On Travel website – “... the information is similar to what I searched for in Tripadvisor, it cross-referenced well with Tripadvisor, and I feel that the information I get of my search is reliable.” (P190)

Content credibility. Users favoured concise and updated content as strong information clues for ease of search. The professional use of language and writing style is associated with credible information. Visual elements and information with entertainment value seem to appeal to participants.

On Travel website – “...the editorial control over information is present..”. (P129)

On Food website - “...engaging articles, it’s more personal...” (P179)

Appropriateness/relevancy credibility. The participants expected a certain level of connection that linked the content appropriately and relevantly to other sources.

On Travel website – “... Linked well to other relevant sources...” (P129)

Weak information clue

Authorship credibility. In the absence of the knowledge of the source of the website, such as its popularity and expertise, users felt uncertain of instilling trust in the website.

On Food website : “...I have never heard of it before, doubt about it.” (P083)

“...It’s not credible, the website name, and it’s not famous enough. The blogspot domain decreased credibility.” (P129)\.

Involvement and uncertainty credibility. Users' exposure and previous involvement with the website or source contribute to their believability of the website,

On Food website : "...I have never tried their recommendations before, so not sure if I trust it." (P189)

"...I have never heard of this blogger before, 'shady', and don't know if I can trust it." (P111)

Reviews and objectivity credibility.

On Food website. "...There was no recommendation." (P111). *"...The reviews are generic, and they are not strong reviews."* (P138).

"... I was also looking for articles shared by others – but (there are) no comments from others." (P150)

Content credibility. The participants seem to take the aesthetical element of the websites to convey their positive evaluation and trust toward the source. The participants expressed preference for aesthetical layout of the travel and food websites as follow.

On Travel website. "...The images are more pixilated and not clear. It is amateur (P015). It didn't give a lot of information, only images." (P129).

On Food website. "... The site doesn't look pleasing, don't know whether to trust. I don't like 'century' font, and the background is totally white." (P083).

"... It looks boring, white background, and I don't like italic (font).." (P096).

"...The webpage design looks amateur; the font is basic with no (light) colour." (P177).

"...It's not something that I want to search because of more text (P015). The information is messy and not coherent". (P034)

Appropriateness/relevancy credibility. Participants tend to look for current information and content to aid their effort in information seeking. Outdated content was interpreted as weak information clues, which resulted in the negative perception.

On Travel website – “... I didn’t get any concise information.”

On Food website – “...because most of its content is from 2013 to 2015 at the links, it loses some currency and relevancy.” (P190)

“...The categorical links do not look like (it provides) a lot of reading. Some posts are not updated.” (P143)

Usability and navigability credibility. The participants assessed the usability and navigability of the hyperlinks if it provides strong or weak information cues. Sundar (2007) suggested that these clues can empower or eliminate content effects on quality evaluation.

On Travel website – “...it is hard to navigate...” (P115)

On Food website – “...The categories are messy, and contents are all ‘over the place.’” (P110)

“... It is difficult to find information, there is no tag, and it’s not organised.” (P123)

The qualitative content analysis revealed that users leveraged on explicit and implicit cues to evaluate the websites. The implicit cues were expressed in their perception of authorship credibility, popularity, familiarity and involvement credibility. The explicit cues were articulated in their preferences such as reviews and objectivity, content, usability, and navigability credibility. Explicit cues refer to the content, such as the visual and text elements, displayed on the websites (Hilligoss and Rieh, 2007). As users navigate from one webpage to another, these external clues or visual elements facilitate the interpretation of the content, and web navigation through the linkage of webpages through hyperlinks.

The descriptive statistics illustrated in Table 17 showed the overall percentages of the participants’ perceived strong and weak information clues on the travel and food websites. The aggregate of the overall positive and negative comments on the strong and weak information clue were derived from Table 16, through the magnitude coding (see also Table 16).

Table 17 *Descriptive statistics of strong and weak information cues*

Websites	Information cues		Total %
	Strong	Weak	
Travel webpages	69%	31%	100%
Food webpages	14%	86%	100%

Further T-test was performed, and the data revealed a statistical difference of the users' credibility assessments on the travel and food websites, $N = 160$, for the Travel website, ($M = 5.02$, $SD = 1.66$, $t(38.21)$, $p < .001$) and Food website, ($M = 4.02$, $SD = 1.41$, $t(36.12)$, $p < .001$). The data derived from both the qualitative and the quantitative analysis demonstrated evidences of the users' appraisal of strong information clues of travel website was assigned a higher evaluation, and the evaluation of weaker information clues on food website was assigned a lower evaluation.

The preliminary findings above demonstrated that the implicit and explicit cues of author, referee, involvement, content, objectivity, trustworthiness, and credibility reflected strong and weak information clues. Generally, advertisements are reflected as elements with weak information clue, signifying the irrelevance of the element to meet information search task. This data did not factor in the task specificity and topic knowledge if they affect the evaluation of the websites.

The aim of the study is to further examine the factors of task specificity that include task difficulty and topical knowledge and its effect on website evaluations.

Task specificity and evaluation

With regard to both travel and food websites, the descriptive statistics showed that users of the *specific* task group as compared to the *non-specifically defined* task group, evaluated highly on both websites: **Travel** website, ($M_{non-specific} = 4.99$, $SD = 1.73$, $M_{specific} = 5.05$, $SD = 1.60$); and **Food** website, ($M_{non-specific} = 3.96$, $SD = 1.35$, $M_{specific} = 4.07$, $SD = 1.47$). The data was generated from the credibility ratings by both task groups. There is no significant relation between task specificity and credibility assessments of the websites, $N = 160$, **Travel** website, ($r = .016$, $p = .81$); **Food** website, ($r = .028$, $p = .61$). Both *specific* and *non-specific* task groups evaluated a higher level of credibility on the travel site than on the Food website. This is attributed to the source and the informative hyperlinks of the travel website, that received positive perception and evaluation.

Topical knowledge, task difficulty and website evaluation

Task difficulty considers the aspect of personal characteristics, and computational efficiency (Campbell, 1988). Personal characteristics involve an individual's familiarity or knowledge of the task, span of attention, computational efficiency and the constraints embodied in the essence of time and task characteristics. Wildemuth, Freund and Toms (2014, p. 1121) conceded that task difficulty is defined by these authors (Campbell, 1988, Gwisdka and Spence, 2006) as "participant's perception of the task difficulty after he or she had completed the search." Kim and Rieh (2005) highlighted that it is not a common approach to ask participants to rate their perceived task difficulty after reading the task instructions, and before they started the information search. In operationalising task difficulty, generally researcher adopted the Likert scale questioning to garner responses on the participants' perception of search task difficulty (Wildemuth, Freund and Toms, 2014). Conversely, Wittek, Liu, Daranyi, Gedeon and Lim (2016) employed a post-search survey to examine users' perceived search task difficulty and visual elements. In this respect, assessing participant's

perceived information search task difficulty and topical knowledge was conducted after the experiment.

To investigate if task difficulty affects users' evaluation of the travel and food websites, questions were posed to participants during the interview to rate on a Likert scale of 1-7, least to most difficult (reverse coding applied for clarity), to indicate the level of difficulty for the information seeking tasks on these websites.

As discussed earlier, information seeking and retrieval encompass an iterative process where users sequentially conduct search activities (Choi, 2010) and assess information. Credibility assessments involve a series of judgement (Hilligoss & Rieh, 2008) of constantly accessing cognitive knowledge and past experience in completing the task. Users who possess prior knowledge of a search topic may leverage on the mental effort and knowledge to evaluate information. Hence, it is important to understand the notion of topical knowledge and task challenges in influencing users' evaluation.

Topical knowledge

To examine the knowledge of the travel and food search tasks, participants were asked if they have searched for the topics stated in the instructions of the information task. The value 1 was assigned for 'No' and 2 for 'Yes' responses. Researchers' studies (Kelly and Cool, 2002; Liu, Kim and Creel, 2013) on topical knowledge measured knowledge of search task by asking their participants on their knowledge with the topic administered during the research. Liu, Kim and Creel (2013) used topic knowledge and topic familiarity interchangeably in their study.

The descriptive statistics indicated that participants possess lower topical knowledge in the travel topics, ($N = 160$, $M = 1.24$, $SD = .43$), than the food topics, ($M = 1.66$, $SD = .47$). The indication of low topical knowledge in the travel search topic may be attributed to the

destination topic of 'South Africa' in which the participants expressed that they had no experience in this subject search.

A Sobel test (Appendix O) was performed to examine the mediation effect of topical knowledge (predictor), task difficulty (independent variable) and credibility evaluation (dependent variable). The Sobel test showed that for **food website**, the statistical result is 6.72, $p < .05$, and there is an association between task difficulty (IV) and credibility evaluation (DV). For the **travel website**, Sobel test showed the statistical result of 7.95, $p < .05$. The test suggested that there is a mediating effect of task difficulty in topical knowledge and evaluation of food and travel websites.

A hierarchical regression with two models was performed to examine the relationship between task specificity, task difficulty and website evaluation, control for topical knowledge. (Table 18)

Table 18 *Summary of Hierarchical Regression Analysis for variables predicting credibility evaluation*

Variable	Food Website		Travel Website	
	β	R	β	R
Step 1				
Topical knowledge	-.391	.132	-.08	.08
R^2	.017		.22	
Step 2				
Topical knowledge	-.525*	.221	-.09	.15
Task specificity: non-specific and specific task	.157		.01	
Task difficulty	.179*		.13	
ΔR^2	.031		.12	

Note : * $p < .05$

Food website. The result showed a significant association between the predictor variable, topical knowledge of food and evaluations. The negative correlation suggested that without topical knowledge, users tended to appraise high level of evaluation of the websites, ($\beta = -.53$, $t(156) = -2.19$, $p < .05$). Topical knowledge account for mildly 2% of the variation in credibility evaluation. In including task difficulty, it increases to 3%. For **task specificity**, there was no significant association between task specificity and credibility evaluation ($\beta = .16$, $t(156) = .71$, $p = .48$). For **task difficulty**, the result indicated a significant relationship between the level of task difficulty and evaluation on food website, ($\beta = .18$, $t(156) = 2.22$, $p < .05$). Participants who encountered a higher level of task difficulty and do not possess knowledge of the food subject rated higher levels of evaluation of the food website.

Travel website. The result showed no correlation between topical knowledge and website

evaluation, ($\beta = -.09$, $t(157) = -1.08$, $p = .28$), implying that there was no association between topical knowledge and evaluation in the travel website.

The association between task specificity, level of task difficulty and credibility evaluation was not significant, task specificity, ($\beta = .01$, $t(157) = .08$, $p = .93$), level of difficulty, ($\beta = .13$, $t(157) = 1.62$, $p = .15$).

Finally, the results from the ANOVA (Table 19) confirmed a significant main effect of topical knowledge and evaluation of **food** website, ($F(1,159) = 4.27$, $p = .04$, partial $\eta^2 = .03$), and an interaction between topical knowledge and website evaluations. There was no significant effect on the topical knowledge and evaluation of the **travel** website, ($F(1,159) = 1.93$), ($p = .16$, partial $\eta^2 = .01$).

Table 19 *ANOVA of topical knowledge and credibility perception*

Dependent Variable	Mean Square	F	Sig.	Partial Eta Squared
Credibility- Food website	8.24	4.27	.04	.03
Credibility - Travel website	5.26	1.93	.16	.01

Food website

Without topical knowledge – food topic

Result showed a significant difference in the topical knowledge and website evaluation. On the food website, when topical knowledge is low, the evaluation is higher, ($M = 4.28$, $SD = 1.11$), compared to participants with the knowledge and evaluation, ($M = 3.99$, $SD = 1.53$).

The follow-up simple effect tests showed an interaction effect between the topical knowledge of food topics and evaluation, ($F(1,159) = 3.69$, $p = .05$, partial $\eta^2 = .02$). There was a significant effect on mean differences between **travel and food** search in relation to topical knowledge and evaluation, ($F(1,159) = 4.27$, $p = .04$, partial $\eta^2 = .03$). (Table 20).

Table 20 *Post-hoc simple effect test of topical knowledge and credibility assessment of Travel and Food websites*

Source	Dependent Variable	Sum of Squares	F	Sig.	Partial Eta Squared
Topical knowledge_Food	Credibility- food website	7.12	3.69	.05	.02
	Credibility - travel website	.87	.32	.57	.00
Topical knowledge_Travel	Credibility- food website	8.25	4.27	.04	.03
	Credibility - travel web	5.27	1.93	.16	.01

Task specificity and topical knowledge

Table 21 presented the descriptive statistics of topical knowledge and task specificity in website evaluation. Without the knowledge of the topic, participants of both *specific and non-specific task* groups of the travel and food information search evaluated highly on the websites compared to the participants with topical knowledge (see also Figure 11)

Table 21 *Descriptive statistics of topical knowledge and task specificity in the credibility assessment of travel and food information search*

Dependent Variable: Credibility _Travel and Food		Travel	Food
Topical knowledge	Task Specificity	Mean (<i>SD</i>)	Mean (<i>SD</i>)
No	Non-specific task	5.07 (1.56)	4.12 (.090)
	Specific task	5.11 (1.55)	4.43 (1.26)
	Total	5.09 (1.54)	4.28 (1.10)
Yes	Non-specific task	4.80 (2.08)	3.89 (1.52)
	Specific task	4.79 (1.84)	3.88 (1.54)
	Total	4.79 (1.97)	3.89 (1.52)

A simple effect test was conducted on the interactions between the topical knowledge and task specificity in the credibility assessment. For users without topical knowledge, there was an interaction effect, ($F(1,159) = 2.95, p = .05$, partial $\eta^2 = .04$) (Fig. 13 and 14)

With topical knowledge – food topic

Both task groups who possess the topical knowledge of the subjects rated equally low the food website. For example, users with topical knowledge gave a lower evaluation on the food website. It can be explained that users with the knowledge the subject and sources, possess better benchmark and specific preferences of the ‘information diet’ (Pirolli, 2007) as compared to user without the know-how of the information searching task on the subject of food.

Figure 11 *Topical knowledge and task specificity in credibility assessments - Food topic*

Travel website

Without topical knowledge – travel search

In the absence of topical knowledge, participants of both *specific and non-specific* task groups of travel information search assessed highly on the travel website, as compared to participants with topical knowledge, $p = .05$ (Figure 12).

Figure 12 *Topical knowledge and task specificity in credibility assessments - **Travel** topic*

With topical knowledge – travel search

The results demonstrated the effect of task specificity, topical knowledge in website evaluation. Users with topical knowledge were more critical in their evaluations of the websites (a summary based on statistical analysis is given in Table 22).

Table 22 *Summary of task specificity, topical knowledge and credibility assessments*

**High/Low – indicate high or low credibility assessment*

Topical knowledge and credibility assessment		
Travel website	<u>Without topical knowledge</u>	<u>With topical knowledge</u>
Non-specific	High	Low
Specific	High	Low
Food website		
Non-specific	High	Low
Specific	High	Low

Based on the ANOVA results reported earlier, it implies that both websites demonstrated that the users' topical knowledge have an effect on their evaluation and perception of the quality of the information.

Task difficulty, topical knowledge and evaluation

Overall users who had prior topical knowledge of the travel topics, and experienced least difficulty in retrieving information appraised the website critically (lower ratings) than users without the topical knowledge.

The simple effect showed the interactions between users without topical knowledge at each level of difficulty on the **travel** search, ($F(1,147) = 2.31, p = .04$, partial $\eta^2 = .09$). (Table 23)

Travel topics search and level of difficulty. It is interesting to note that for the Travel website, although users experienced difficulty in the information retrieval in this website, their evaluation of the travel website was still high. This is aligned to the earlier results that showed the association of the perception of strong websites and higher credibility assessments,

Conversely, participants who do not possess topical knowledge and encountered difficulty with the **travel** search topics appraised higher ratings on the website. [Table 23 and Figure 15]. This may be attributed to the source influence on the credibility perception.

Table 23 *Post-hoc simple effect of level of difficulty and topical knowledge in credibility assessment _ Travel website*

Dependent Variable	Topical knowledge Travel	Sum of Squares	F	Sig.	Partial Eta Squared
Credibility- food website	No	6.53	.53	.77	.02
	Yes	8.04	.79	.55	.02
Credibility - travel website	No	37.28	2.31	.04	.09
	Yes	2.75	.20	.96	.01

Each F tests the simple effects of **Difficulty - Travel** website within each level combination of the other effects shown.

Figure 13 *Level of difficulty and topical knowledge in credibility assessments – **Travel** topic*

Food topics search and level of difficulty. For the food website, no significant effect was observed for the interaction of topical knowledge and the least level of difficulty encountered by the participants (Table 24). Participants with or without the topical knowledge, and who experienced least level of task difficulty (level 7), both evaluated the food website at a similar level, as reflected in the non-significant effect. However, when the participants encountered the highest level of difficulty (level 1-2) and who do not possess topical knowledge of the related food subject, they rated the food website with high evaluation scores. On the contrary, participants who possess food-related knowledge and expressed the same levels of task difficulty exhibited lower assessment scores on the food website. (Figure 14). Users who has search knowledge of the food topic and experienced mild difficulty (level 4-5), the level of credibility perception gradually increased. Overall, participants with the topical knowledge exhibited appraised lower level of credibility evaluations, compared to the group

without the topical knowledge. These findings revealed that task specificity, topical knowledge and task difficulty affect effort in the website evaluation. With topical knowledge and encounter least difficulty, effort was expended in the critical evaluations as demonstrated in the low evaluations. In the absence of topical knowledge and who experienced a high level of difficulty in the search, less effort was used in the website evaluation, as expressed in their high evaluation scores.

Table 24 *Post-hoc simple effect of level of difficulty and topical knowledge in credibility assessment _ Food website*

Dependent Variable	Sum of Squares	F	Sig.	Partial Eta Squared
Credibility- food web- blog	9.25	.94	.45	.03
Credibility - travel web	2.00	.14	.98	.01

The F tests simple effect of **Difficulty - Food website**

Figure 14 *Level of difficulty and topical knowledge in credibility assessments – Food topic (1 - most difficult; 7 – least difficult)*

In summary, the findings shed light on the effects of task specificity and website evaluation.

Discussion

The study on information evaluation behaviour in relation to the websites offers insight on the interplay of hyperlinks, task specificity and website evaluation. The qualitative content analysis showed the typology of users' evaluation on the hyperlinks and visual elements that provide clues. The clues are derived from the implicit cues that refer to the users' previous search experience, topical knowledge or reference from the peer reviews. The evaluations include authorship, referee, familiarity, popularity, and quality of the visual elements. The clues from the explicit cues include reviews, appropriateness, usability, and hyperlinks. Users

explicitly interpreted these cues as positive or negative clues on both websites. The information cues produce an information clue that is subject to the users' interpretations.

The statistical results revealed that the effects of the characteristics and conditions of the content conveyed by the hyperlinks and visual elements on the websites shaped website evaluation. Sites with strong information clues elicit a higher level of credibility perception. For example, the travel website populated with visual elements, the familiarity with the site and link functionality were seen as websites with strong information clues.

Although source characteristic constitutes peripheral cues that may determine an individual's mental effort (Winter and Kramer, 2012) in information seeking, the present research showed that task specificity and topical knowledge affect users' evaluation. This study further demonstrated that clues from the hyperlinks and visual elements aid evaluation. With regard to the web design, participants evaluated favourably on the travel website than on the food website. This is not surprising, as *LonelyPlanet* had projected a positive image of an established institution among online and offline users for its travel information. Although some users expressed the poor pixilation of image on the travel website, the trust level for this site was still considerably higher compared to the food website. Further analysis into task difficulty and website evaluation indicated that users' evaluate website with stronger clues, i.e. the travel website, remain positive even when they encountered some challenges in accessing information for a travel-related topic on this website. Wathen and Burkell (2002) highlighted that the studies by Hovand, Lumsdaine & Sheffield (1949) and Self (1996) suggested that the evaluation at the initial stage relies on the first contact between the information recipient and source in which the message is deemed persuasive in the first instance, but this attitude might not prevail. In contrast, Slater & Rouner (1996) postulated that the content generated by a trusted source and the originator of the website are likely to retain their credibility even with the presentations of less superior content. The results in this

research demonstrated evidence which supports previous studies of source's influence on positive evaluation (Winter and Kramer, 2012). The present study further analysed the task specificity, topical knowledge and task difficulty and its effect on the website evaluation.

The statistical analysis of the association of topical knowledge and website evaluation revealed that in the absence of topical knowledge, participants of both *specific and non-specific* task groups tended to accord a higher level of evaluation than participants with low or no knowledge of the topics. Conversely, both task groups, which received *specifically-defined and less specifically-defined* instructions, who have topical knowledge expressed low level of evaluation for the food website. This can be explained by the fact that users with topical knowledge are equipped with higher skills, knowledge, and information seeking experience which enabled them to benchmark and discriminate information cues of current patch with other sources. As users attained confidence in their knowledge of a particular subject, the expectations set to fulfil their information need naturally increased compared with users with limited topical knowledge. The result based on topical knowledge and evaluation of different websites is consistent with the work of Vakkari (2000), as well as Vakkari and Hakala's study on students' information seeking behaviour where they found that increase in the domain knowledge led to the students' application of stricter relevance criteria (2000). In addition, Choi's contextual study on information seeking showed that users' knowledge of topic is linked to usefulness and confidence (2010).

In the context of task difficulty and topical knowledge, the results of this research further demonstrated the positive linkage between knowledge, task difficulty, and information evaluation. Users who were knowledgeable in the subject-matter and encountered less difficulty in the search task expended effort in being more discerning in their evaluation of the websites. Contrariwise, users who were unfamiliar with the subject-matter search, that is, without topical knowledge, exhibited leniency in the website evaluation. Overall users

equipped with topical knowledge assigned lower scores on the food website. In Hu, Lu and Joo (2012)'s study on familiarity of searched topic and search skills on query reformulation on health information, they found that users with high topic knowledge were more specific in their search performances which was attributed to the users' prior knowledge of the content and search. Conversely, users with lower topical knowledge encountered difficulty in selecting appropriate search tactics when conducting tasks at the initial stage (Xie & Joo, 2010). They were also less efficient in selecting concepts (Wildermouth, 2004), investing more time and effort in their search queries (Qu, Liu and Lai, 2010). Topical knowledge affects information judgement and cognitive information processing. This was demonstrated in the characteristics of knowledgeable users who tended to be more critical of the websites.

Hilligoss and Rieh (2008) advocated that credibility should not be regarded as absolute in information content or sources; rather, one should consider the social context where an individual's perception of the context influences their assessment. The assessment is derived from the other's perception within the social environment that the users interact with, and the level of perception may surpass the real information environment. The present study extended the website evaluation to include task specificity, topical knowledge and task difficulty.

The information seeking concept posits that users adapt strategies and technologies where attention and effort are drawn to the clues from the information environments. The clues are 'major controlling variables' (Card, Pirolli and Van Der Wege, 2001, p. 7) that enable users to make decisions based on link selections on the website. Through both quantitative and qualitative analyses, this study integrated the user effort, task specificity, hyperlink aesthetic and evaluation in information seeking. My study demonstrates that information seeking behaviour does not operate in singular stage, but users apply both effort and evaluations that are affected by task specificity.

Chapter Summary

This chapter has presented the results based on the research questions and hypotheses which were set out in chapter four. This study found that users' involvement in selecting hyperlinks differed in different web environments, namely the travel and the food websites. The findings demonstrated that task specificity has an impact on user effort in hyperlinks aided through web navigation. When task specificity is low, user efforts is reduced through higher hyperlink engagements. This means, when task is less defined, users navigated to more webpages. Conversely, when task specificity is high, users incur more effort on the current webpage through longer fixation time and hence the lower involvement of hyperlinks.

The second section of this chapter reports the effect of task specificity and website evaluation. The typology of visual elements was identified from the qualitative content analysis. The results demonstrated the interplay of visual elements, task specificity, topical knowledge, task difficulty and website evaluations.

CHAPTER 6

GENERAL DISCUSSION

The theoretical framework in this research was established to address the current gap in information seeking concept. With the advent of technological mechanisms such as hyperlinks and information design, information seeking stages and process seems inadequate. Factors such as user effort, task specificity and evaluation need to be studied in the context of web design. Hence, my research explores and investigates the users' effort in engaging the hyperlinks and cues on different websites, and examining the relationship of task attributes such as task specificity, task difficulty and topical knowledge in website evaluation. The literature review in chapter two shows that the salient concepts of information seeking behaviour encompass the effort invested and attention focus during web navigation. That is, users' interaction with the proximal cues such as hyperlinks to assist navigations within or across webpages in the online environments require effortful information seeking (Pirolli, 2007). The notion of applying techniques implies that users adapt, regulate or conduct iterative search techniques, and allocate their attention and mental effort on information for maximum gain of their search goal (Gattis, 2002).

Users accessing the online resources have different information needs and purposes while performing an information task. The needs, purposes and values of the users (McKemmish, Manaszewicz, Burstein and Fisher, 2009) call for varied information-seeking activities, search strategies and tactics (Marchionini, 2006). In retrieving information, users' effort are exhibited in demonstrating certain strategies and techniques, while at the same time weighing the value and cost of information retrieval when navigating the webpages. This active search behaviour connotes a judgemental attitude, hence, understanding users' evaluation of the cues and environment is relevant to the study of information seeking.

Past studies (Fu and Pirolli, 2007) have suggested the correlations between activation of links and its position on the web. However, there have been few studies that analyse the characteristics of hyperlinks on effort, and factors that influence information evaluation. Sundar, Knobloch-Westerwick and Hastall (2007) suggested the relationship between strong source cues and positive credibility ratings. Tomasi's examination of cue from hyperlinks was conducted on search engine ranking page environments (2014). However, it is uncertain if the users' effort in hyperlink selection is similarly exhibited on different websites.

Information seeking and foraging are task-oriented, where users are guided by their information goals to meet their information needs. Information seeking studies had only focused on the hyperlinks, that drive web navigation behaviour. However, it is not clear if the a user's knowledge and the characteristics of task affect information seeking techniques in the online environments. As evaluated in chapter two, various studies observed that task difficulty and type of task instructions implicate users' search behaviour online (Bystrom, 2000; Vakkari, 2002; Bystrom and Jarvelin, 1995).

In this study, the employment of the eye-tracking method provided a further examination of users' effort on the visual elements, and the engagement of hyperlinks. Through quantitative and qualitative analyses, this study integrated the links between users' effort, task attributes and information evaluation. The findings showed that the value and cost users place on the characteristics of the link structure and cues. This research sheds light on understanding the individual's diverse information needs and task goal. It is imperative for the information provider to offer appropriate and reliable link structure and cue to assist users in making quality information decision-making in the online environments. This is critical in maximising the return of users' information search in the abundance of information cues. Moreover, evidence in this research demonstrated that users with prior topical knowledge and task specificity do influence website evaluation.

The implications for this study pave the way for future research to investigate the association between knowledge and online users' decision making and learning, and how hyperlink structure can be leveraged to guide search queries to alleviate the challenges in acquiring quality information and perceived cost of information search. A general discussion of the results in this experimental study is explained in the following sections.

A summary of key findings is illustrated in Table 25.

Table 25 *Summary of key findings*

Research questions	Key findings
RQ1 : How do hyperlinks affect users' effort in information seeking?	<ul style="list-style-type: none"> • The image, headers, categories hyperlinks decreased users' effort by aiding web navigation • The more informative hyperlinks are (e.g. on Travel website), the less effort user expend, due to the clue from the hyperlink. Therefore, users are able to navigate to more webpages to look for relevant information. • The lack of descriptive hyperlink (e.g. Food website) increases user effort in the search through longer fixations on the webpage. Hence, more effort is spent on current webpage and lower navigation to other webpages. • Conversely, doubtful hyperlink as perceived by the users (e.g. advert) reduces user effort of interpreting information - as they perceived it as risk or cost. So, there was no engagement in the advert hyperlink. • The average number of 1-2 hyperlink clicks is in line with past studies that demonstrate users' effort in filtering information. Filtering and scanning information reduce effort in information seeking, with the clue from the image, headers and categories hyperlinks.
RQ2 : How does task specificity affect users' effort in information seeking?	<ul style="list-style-type: none"> • The findings indicate that when task specificity is low, users exert less information seeking effort on a webpage and scan more webpages. Hence, users visited more web pages through involvement in hyperlinks, indicating reduced effort in information seeking. • When task specificity is high, users exhibited more effort in looking for information on the website, therefore there is a low involvement of hyperlinks. • Results also show that website design has an effect on user effort in hyperlink engagement.
RQ3 : How does task specificity	<ul style="list-style-type: none"> • The association of task specificity and evaluation of websites

affect users' evaluation of website?	<ul style="list-style-type: none"> • The correlation analysis showed no significant relation between task specificity and evaluation of website. • Task specificity that incorporates task difficulty and knowledge of topic interact with website evaluation. For Food website, there is a significant relation. <p>Food website For task difficulty, the result indicated a significant relationship between the level of task difficulty and evaluation of websites. Participants who encountered a higher level of task difficulty and do not possess knowledge of the food subject rated higher on the quality of the food website. The findings indicate that task difficulty and topic knowledge affect evaluation.</p> <p>Travel website. The result indicated that there was no association between task specificity, task difficulty, topical knowledge and evaluation in the travel website. The findings demonstrate that hyperlink aesthetic may override task specificity and evaluation of website. With good website design, it eases user's information seeking effort, and garner positive perception.</p>
--------------------------------------	---

Aesthetic of hyperlinks

The quantitative and qualitative measurement produced affirmative results of identifying the characteristics of hyperlinks and visual elements in relation to the user effort and evaluation of webpages. The statistical and eye-movement log analysis indicated images, headers, text and categories hyperlinks transmit strong information clues, with variations on the engagement of hyperlinks and cues. Hyperlinks attached to categories such as archives of past articles, or subject categories provided useful signpost generally guided users web navigation in this study. For example, on the travel website, the statistical results showed a higher activation of images, text and headers hyperlinks. Similarly, the eye-tracking analysis on the food website reported active engagement of categories, headers and read-more hyperlinks. Users see value in clicking on the categories not only to exit the current site, rather, because the links emit a meaningful cue that draws their interest. The meanings interpreted from the hyperlinks enable users to make decision to navigate to another webpage. Hence, these hyperlinks aid in navigation, and lower their effort incurred in lengthy search. As a

participant said: *“the text sounds interesting.”* The embedded meaningful text and captions within the images appear to convey stronger information clue. As evident in the travel website, text presented along with images garners higher engagement because the text offers key content that enables users to make instant decisions on whether to explore further for information. This study demonstrates that the hyperlink aesthetic is crucial in interacting with the user effort. The hyperlinks can be perceived as of value or cost to the users. Furthermore, hyperlink minimises their effort in lengthy search, and attract them to navigate across the webpages

In the post-experiment interviews, participants were asked for their reasons in clicking on the hyperlinks. The responses revealed that hyperlinks bring with it entertainment and visual value. On the food website, participants described the attractiveness of the pictures depicting food because the food had an appetizing appeal. Thus, the visual value described by the users is aligned with the information seeking behaviour in which the clue of hyperlinks draws the users’ interests. The results showed that semantics interpreted from the information cue, that is the words and meaning resided within the textual content, have resonance. This resonance value relates to personal interest and thus entices users to respond to the elements. Information seeking behaviour involves sorting, filtering, and exploring for more information where users tend to interpret the cue from the visual element. If it produces strong clue that attracted the attention of the users to engage on it, thus minimising their effort, they will explore for more information. For example, some responses on the value derived from hyperlinks were: *“the writing intrigues me...”* (P008); *“ I want to see if there are more information on another page. If things on the list are more interesting, so next link must be equally interesting.”* (P070). Users adopted the filtering approach by narrowing the topic through the use of categories hyperlinks, to lower effort and save time. The categories and

text hyperlinks are cues users look for in assisting them to find information that are a close match to their expectations.

There was an absence of link clicks on advertisements for both websites, which is indicative of weak or no information cue from the advertisement. From the responses, participants exercised caution in engaging the links and expressed fear that it may contain a ‘virus’, for example, “...*the advertisement may have virus.*” (P019). One participant also said that “*the advertisement is dubious*” (P036), and “...*will lead to lousier content*” (127), or, “*It is not related to what I’m looking for..*” (P004). These defensive selections of sponsored links and cues denote the cost of web navigation as perceived by the users. As postulated by Nielson and Kara (2010), users adopt the defences of ‘selective disregard’ and ignore secondary cue, thus, turning blind to the banner (p. 116), as they sieve through items that do not serve their information need.

One striking finding was the effort and attention given to the hyperlinks and elements showed that clues from the hyperlinks and the visual elements influence emotions in information seeking. For instance, there were expressions of anger, such as “...*advertisement insert..makes me angry*” (P138) and “...*advertisement and “pop-ups ..obstruct my browsing.*” (P129). Further, the enhancement of images brought gratification to the users’ information seeking experience, as participants responded with favourable feedback. But participants also expressed caution and irritation of engaging in hyperlinks such as pop-ups or advertisement icons for fear that they may harm their computer and disrupt their search. The implications in this research revealed how emotional involvement of the hyperlinks and visual elements were expressed as value or cost during information seeking. A sponsored advertisement banner or icon that is clicked by the information seeker may bring value in the form of revenue to the owner of the website (Hofacker and Murphy, 2000), but it was also perceived as an opportunity cost to the user. These authors highlighted that some websites buy banners to lure

information seekers to other websites to generate revenues. In line with information seeking approach, the paid advertisement links are ‘prey’ that emit information scent (Pirolli and Card, 1995). In making a decision to click on the link, a user foregoes the value of finding information relevant to the task and diverges to other sites, which means that the search time may be prolonged.

When information search is task-focused rather than general browsing, individuals exhibit the utilitarian behaviour. That is, they take a practical approach in information seeking by being selective of the links that have only useful value (Hofacker and Murphy, 2000; Pirolli and Card, 1995). The quantitative and qualitative analyses in this study revealed that users are discerning in assessing the value and cost of responding the hyperlinks and cues, and thus reducing their effort in information seeking.

Task specificity and web navigation

The effort through discriminating between strong and weak information cue are contingent on the task specificity. Individuals are able to attend to the appropriate cues and categorizations (Blair et al., 2009) and discriminate between the priorities of search task or salient cues they encounter during information seeking. The information search task constructed for the specific task group and the non-specific task group varies in the task descriptions. The *specific task* instructions included specific information. For example, for the travel topic, the task specifies the number of places in South Africa, culture and lifestyle, and two bloggers’ stories that the participants need to search. For the specific food search instructions, the task stipulations include the search for two food bloggers’ recommendations, seafood and vegetarian restaurants, each in the East and West zones. The *non-specific task group* were not provided with detailed instructions on the information task. They were given

general task instructions requesting them to search for information on South Africa and popular restaurants, reviews and recommendations.

In considering how task specificity affect hyperlink involvement, the results in this study revealed that when conducting *general (non-specific)* search task, users tended to visit more webpages and exhibited rapid information scanning with lower attentional focus and reduced effort in the search. The ambiguity in the *non-specific task* descriptions may be perceived as an easier search task, whereby it does not impose rigid information retrieval conditions. Hence, users tended to be less focused and skimmed through webpages and demonstrate ease in information seeking. This finding is in sync with what Marchionini and Shneiderman had postulated that the general task is exploratory in nature so information users will perform an information scanning pattern until they find unexpected information (1988).

Conversely, given the *specific*, well-defined task instructions, users appear to have low involvement in the hyperlinks but displayed higher attentional focus and effort invested on staying longer on the websites. This implies a task-oriented focus in the information behaviour. The *specific-task* group's engagement of the categorical, image and headlines content was stronger. The specific descriptions of the task descriptions contributed to the focused search higher effort required to look for certain information. For example, in looking for specific information on travel topic, participant (P108) expressed that he would look for clues such as "*what to do*", or "*accommodations*". Another user (P109) responded that for a specific food topic, she needs to look for "*vegetarian*" or "*seafood*" and would focus on this information. On the travel website, the text hyperlink to the picture emitted a stronger information cue as participant interpreted the quality (Choi and Rasmussen, 2002). In this study, it is evident that the degree of task specificity propels users to conduct, modify, and filter search queries and high task specificity relates to more effort invested in information seeking (Jarvelin and Ingwersen, 2005). A well-defined task goal provides the information

seeker with clear directions for their information search, hence, the strategies and techniques conducted by the users would be different (Frost, Taylor, Noakes, Markel, Torres, Drabenstott, 2000). The *specific task* group exhibited effort in viewing, reading, analysing image elements, while the *non-specific* task group conducted more web navigation but with a lower effort and focus on image cues. This inverse effect of effort and navigation is indicative of the adaptive approach of information seeking as users selectively retrieve information. In this study, the task specificity included 'lookup' task relating to fact-finding in inquiring 'who, when, and where' information retrieval (Marchionini, 2006, p.42). Marchionini (2006) suggested that fact-finding information retrieval requires analytical search strategies to generate precise results. Hence users' effort were not only influenced by the hyperlinks and other visual cues but they were also affected by the task specificity and the experience of task difficulty.

A point of interest observed from the users' clustered fixations demonstrated their information filtering techniques. That is, users viewed a group of visual and text content, placed in proximity of each other, were viewed as a whole. Their fixations on hyperlinks and visual objects are contingent on whether the first hyperlink gives a strong clue. The implications indicated that cues from the content and hyperlinks that are prominent, and initially noticed by users as strong or weak information clue may affect the user's decision to click on the rest of the hyperlinks that are located within close proximity. Furthermore, the results in this study revealed that advertisement banners or icons emerged as weak cue and they were mostly considered as irrelevant cues by the users. This finding appears to be in conflict with Kalyanaraman and Ivory's study which suggested that picture attachment on the advertisement will garner higher interactions and positive responses from users (2009). The results in this research provide a useful guide to the technological development to enhance human-computer information interactions, in particular the web designer of interfaces. To

enhance the aesthetic of the hyperlinks to aid navigation and user interactions, it would be useful to provide meaningful and accurate message on hyperlinks within the view of users.

Evaluation of website

The results supported that the users evaluated the website with strong hyperlink clue and a higher level of credibility appraisal. Conversely the website with weak information hyperlink clue leads to a lower level of credibility assessment. The findings demonstrated that website populated with descriptive hyperlinks assist users in web navigation and garner positive assessments. As this research discovered, interactions with the hyperlinks and visual content are dependent on the information descriptions stipulated within the task instructions.

The mixed methods analysis showed that source, popularity, familiarity, involvement credibility are elements that characterise implicit cues or predictive judgement. Possessing the subject knowledge enables the participants to leverage on their prior knowledge (characterised as predictive judgement in this study) to facilitate their information search. The explicit cues, that involve evaluative judgement, were expressed in the users' preferences for referee, objective content, usability, and navigability credibility. In an unfamiliar web environment, the affective effect of the appeal of the website design and features play a critical role in securing trust from the online users (Pengnate and Sarathy, 2017)

Ingwersen and Jarvelin (2005) suggested that a distinct task goal precedes focused search behaviour. The present study demonstrated similar information behaviour for focal attention and provides clarity on how the type of task affect users' information judgement of the web environments.

The quantitative and qualitative analyses demonstrated that the users' positive evaluation correlate with website with strong information cues while negative evaluation cohered to websites with weak cues.

The data showed that users expressed a high level of evaluation on the travel website, even though they experienced task difficulty in the information search. This indicated that the website with cues that perceived as strong cue override task difficulty. The results support Slater and Rouner (1996)'s postulation that information resources produced by perceived credible source are likely to maintain their credibility perception even when weak informational cues are present.

Topical knowledge and website evaluation

The rationale for examining website evaluation, rather than relevance in this study, is that users may assess relevance of information in relation to task specificity. Further, if the information is relevant, users may not necessarily perceive the websites favourably. As Robins and Holmes (2008) asserted, the configuration of the information elements displayed on the website influence users' information judgement.

The quantitative results demonstrated that regardless of task specificity, in the absence of topical knowledge, users' evaluation of website was high as compared to users who possess topical knowledge. With topical knowledge, users tended to apply stricter evaluation. This outcome is aligned with a previous study (Pennanen and Vakkari, 2002) that higher topical knowledge leads to critical judgement of information. In addition, Pirolli (2007) had suggested this information behaviour relates to users' capability of applying standard and personal preference for certain information source and cues with prior information knowledge. Shiri (2005) posited that users who possess a higher level of topic knowledge are able to formulate relevant queries and terminologies. The current research showed that users who possess strong topical knowledge and who encountered low level of task difficulty applied stricter assessment in the website evaluation. This phenomenon is attributed to users' prior knowledge in the searched topic where they tend to discriminate information sources and cues. As such, they are likely to be evaluative in adopting an efficient approach in their search goal.

As information seekers attained confidence in their knowledge of a particular topic, they are naturally more analytical and diagnostic in their level of expectations and adapt preferences to fulfil their information needs.

My study on topical knowledge and website evaluation sheds light on the importance of task specificity and knowledge affects effort and evaluation. Vakkari and Hakala (2000) demonstrated the relationship between users' domain knowledge and stricter evaluation criteria and affirmed the association of users' topical knowledge and credibility evaluation. The authors suggested for information researchers to further examine users' subject literacy in their effective decision-making and information evaluation behaviour to fulfil task performance. As information seeking involves users' strategies in continually modifying and evaluating their search queries during information retrieval process, will users with a higher level of literacy in a particular topic or domain gain more benefits (e.g. accepting accurate information, making better decisions) than users with lower literacy levels?

Task difficulty and website evaluation

With topical knowledge and less difficulty in the search task, participants exhibited acute assessment of the website. On the contrary, users who encountered higher level of difficulty and scant topical knowledge appeared to be more lenient in their appraisal of the websites. For the food website with weaker information cues, participants without topical knowledge rated lower evaluation in credibility. This behaviour is attributed to the lack of ability to discriminate different information cues and efficiency in selecting concepts (Wildermouth, 2004) in the absence of scant subject knowledge. This result builds on past studies on the credibility concept (Hilligoss & Rieh, 2008) and topical knowledge (Hu, Lu & Joo, 2012; Vakkari, 2000; Xie & Joo, 2010) in examining the roles of task specificity and topical knowledge in website evaluation.

The qualitative data and coding from the interview responses showed the task specificity relates to users' task conception, information processing, and evaluation. The specific task group expressed a stronger view on information overload. Despite the perceived information overload, the specific task group expressed higher confidence in starting the search task, and some participants said they knew what they were looking for. The clarity of the task descriptions might have contributed to their confidence, and provided a clear direction to them to perform the tasks.

On the level of task difficulty, the *specific task group* commented on the difficulties in decision-making while deciphering information. This is attributed to the specific information that they need to collect to complete the information search task. They also adopted filtering techniques like narrowing the range of the search options or selecting top-ten websites on the list. There was a tendency among participants of taking the cue from the task instructions. The exact task descriptions helped the information seeker to prioritise and focus on the specific information as was expected. This group tended not to trust the accuracy of the information. The evaluative behaviour is in sync with the quantitative data that the specific task group demonstrated acute evaluation in information credibility.

The *non-specific group* exhibited satisfaction in the sufficiency and availability of information on the websites. The participants contended that there was a lot of information and suggestions available with enough information on the internet. Although the *non-specific* group found the information search task straightforward and easy with less restrictions, they expressed uncertainty when starting the search, demonstrating a distinctive task behaviour which was different from the specific task group. This may be due to the fact the *non-specific task* instructions were ambiguous and broad, resulting in the absence of a clear direction of where and how to initiate the information search. In contrast with the specific task group who were more evaluative, the *non-specific task* group commented on the acceptance of general

information. With the general, *non-specific task* descriptions given, the participants demonstrated the initiative to find more information, explored new information and considered additional elements. With less specific instructions stipulated in the task, the participants' ease in information seeking and lesser effort were demonstrated in their higher navigation.

The distinctive outcome of the information seeking behaviour in these two task groups demonstrated that task specificity affects users' effort and evaluation in engaging the hyperlinks and evaluation of information.

This research contributes to the extant scholarly work, theoretical and methodological approaches of examining user effort and information evaluating integrating the critical aspects of external stimulus such as hyperlinks, and factors of task and credibility. This study offers further insights into the information seeking behaviour in evaluative information judgements, topical knowledge and task influences. This result of this study shows hyperlinks have the effect on reducing user effort and increasing evaluation during information seeking. In addition, task specificity and topical knowledge affect information evaluation.

Policy makers can leverage on augmenting information cues on their website that offer strong information clue that for learning and education to instil better-informed online consumers and promote quality decision making. For example, by presenting reliable information of a credible product, providing accurate health information, setting up quality hyperlinks to reliable websites can bring about information discernment. These cues have the potential to shape consumers' rational decisions making. Importantly, in the organisational and institutional contexts, providing clarity in task goal such as well-defined task stipulations will guide an information seeker in a focused search due to time efficiency, afford critical evaluations and decision-making during information processing and retrieval.

This research has established opportunities for future studies to investigate the association of users' multiple information task goals, knowledge acquisition and decision-making with information behaviour. Further studies on task attributes could include accuracy of task outcome and task performance through questions and answers, discriminations between work task and personal task to assess information seeking behaviour. It is beneficial to extend this research how the aesthetic of hyperlinks and visual content interact with information judgement in quality and trust perception. For example, the cornucopia of health, product, service, and news information in the web environment pose challenges for users to assess the quality and validity of the information.

CHAPTER 7

CONCLUSION

Contributions and implications

Overall, this research shows that informative and aesthetic hyperlinks and image content with descriptive text reduce information seeking effort. Task is another factor that interact with hyperlink such that when task specificity is high, effort invested in hyperlink interactions is low, that leads to lower web navigation.

My study contributes significantly to the theoretical and methodological approach in understanding the influence of user effort, task specificity, hyperlinks and evaluation. Hence the solutions for policy makers and web designers to facilitate information seeking 1) create meaningful semantics relevant to the hyperlinks to reduce user effort and increase credibility perception 2) strategic positioning of primary links clustered within a region offers visibility and prompt user action. A good website design perceived as credible will lead to repeated visits to the site, and induce consumers to make rational decision, or act on purchase.

Secondly, this study incorporated task specificity and evaluation of websites, in particular the level of task and credibility assessment. Significant results were demonstrated in the interplay of the characteristics of task, i.e. task specificity, task difficulty and topical knowledge and users' information evaluations in information seeking.

Thirdly, the research employs the visual analytics of eye-movements and performs the quantitative and qualitative methods in users' effort and attention on hyperlinks. The study contributes to the measurement of effort through link-click counts, visual analytics and the qualitative approach of self-reported feedback from the participants.

Limitations

There are some limitations in this study that warrant attention. Firstly, the convenience samples were generated from student-participants, and it may not be representative of the general population of working adults who have different information seeking experiences. One justification can be offered is that the administration of the information search tasks was for cuisine and travel-related topics, and these topics are common day-to-day search for most people, including students. Secondly, this study measures user effort through hyperlink clicks and fixation durations. User effort may be assessed by self-report on Likert scale to understand their level of effort and ease of the search. Thirdly, the specific selection of two websites for the computer laboratory experiment has its restrictions. The two websites were selected for its different subject matter, and for the purpose of consistent comparison of information retrieval by all participants. The topics selected for the search task were travel and food subjects, and the specific websites understudy were travel and food websites. Although the task descriptions and selected topics of travel and food are prescriptive in this study, the results and implications of the information seeking behaviour and task-related factors can be extended to other human-computer interactions such as healthcare, news media, e-commerce and other online environments. The constraints of time in this research and the physical setting in the computer laboratory environment may affect users' information seeking and retrieval behaviour. Participants may not engage in a gratifying information search as the task was carried out in the presence of and under the observation of the researcher. The information seeking behaviour may be different if they were alone conducting the information search in their private space, at home or on school campus.

For future research, it would be beneficial to consider user effort in task performance in information seeking. It could explore appropriate website interface design to meet users' basic

fact-finding to complex analytical decision making and knowledge acquisition needs. Last but not least, there is scope to investigate cognitive factors to include users' proficiencies, such as expert or novice, and individual learning style in applying information judgements in studying information behaviour.

References

- Abelson, R.P. (1976). Script processing in attitude formation and decision making. In Carroll, J.S. & Payne, J.W, *Cognition and Social Behaviour*. Hillsdale, N.J.
- Adams, S., de Bont. A., and Berg, M. (2006). Looking for answers, constructing reliability: an exploration into how Dutch patients check web-based medical information. *International Journal of Medical Informatics*, 75, 66-72.
- Adar, E., and Adamic, L.A. (2005). Tracking Information Epidemics in Blogspace of the 2005 IEEE/WIC/ACM International Conference on Web Intelligence, Compiegne, France. 207-214. Retrieved from <http://www.hll.hp.com/research/papers/blogs2/trackingbloedpidemics.pdf>
- Adar, E., Adamic, Zhang, L., and Lukose, R. (2004). Implicit Structure and the Dynamics of Blogspace. *HP Information Dynamics Lab*. Retrieved from www.hp1.hp.com/research/idl/papers/blogs/bloSPACE-draft.pdf
- Agarwal, R. and Venkatesh, V. (2002). Assessing a firm's web presence: a heuristic evaluation procedure for measurement of usability. *Information Management Research*, 13, 2, 168.
- Ahmad, R., Komlodi, A., Wang, J. and Hercegfi, K. (2010). The impact of user experience levels on web credibility judgements. *Proceedings of the American Society for Information Science and Technology*, 47(1), 1-4.
- Ahn, T., Ryu, S. and Han, I. (2007). The impact of Web quality and playfulness on user acceptance of online retailing. *Information and Management*, 44, 263-275.
- Albertson, D. (2015). Visual information seeking. *Journal of the Association for Information Science and Technology*. 66, 6, 1091-1105.
- Albertson, D. (2010). Analysing user interaction with the ViewFinder video retrieval system. *Journal of the American Society for Information Science and Technology*, 61, 2, 238-252.
- Alexa.com (2012). Alexa – Find website traffic, statistics, and analytics. Retrieved from www.alexacom/siteinfo
- Alexa.com (2017). Alexa – Find website traffic, statistics, and analytics. Retrieved from www.alexacom/siteinfo
- Allen, B. (1991). Topic knowledge and online catalog search formulation. *Library Quarterly*, 61(2), 188-213.
- Allen, B. (1997). Information Needs: A Person-In-Situation Approach. In Vakkari, P., Savolainen, R., and Dervin, B. (eds). *Information Seeking in Context. Proceedings of an International Conference on Research in Information Needs, Seeking and Use In*

- Different Contexts*, 14-16 August 1996, Tampere, Finland, pp. 111-122. London, UK: Taylor Graham
- Amchai-Hamburger, Y (2002). Internet and personality. *Computers in Human Behavior*, 18(1), 1-10.
- Anderson, J., and Lebiere, C. (1998). *The Atomic Components of Thought*. Mahwah, New Jersey: Lawrence Erlbaum.
- Anderson, T.D. (2006). Uncertainty in Action: Observing Information Seeking Within the Creative Processes of Scholarly Research. *Information Research*, 12(1), Paper 283. Retrieved from <http://InformationR.net/ir/12-1/paper283.html>
- Anderson, R. C. (2004). The role of the reader's schema in comprehension, learning, and memory. In R. B. Ruddell & N. J. Unrau (Eds.), *Theoretical models and processes of reading* (5th ed., pp. 594–606). Newark, DE: International Reading Association.
- Arazy, O., and Kopak, R. (2011). On the measurability of information quality. *Journal of the American Society for Information Science and Technology*, 62(1), 89-99.
- Aula, A., Khan, R.M. and Guan, Z. (2010). How does search behaviour change as search becomes more difficulty? In *Proceedings of the SIGCHI Conference on Human Factor in Computer Systems*. Atlanta, GA, 10-15 April, 2010. New York. ACM.
- Azeem, M. A. (2012). Consumers' attitudes toward commercial e-mail spam and web pop-ups: interference, perceived loss of control, and irritation. *Information and Knowledge Management*, 2(1), 21e33.
- Balasubramanian, S., Konana, P. and Menon, N.M. (2003). Customer satisfaction in virtual environments: A study of online investing. *Management Science*, 49, 7, 871-889.
- Bankins, S. (2011). Tracking employees' twists and turns: Describing a mixed methods approach to assessing change in the psychological contract. *International Journal of Multiple Research Approaches*, 5, 3, 351-366.
- Bar-Ilan, J. (2001). Data collection methods on the web for informetric purposes – a review and analysis. *Scientometrics*, 50, 1, 7-32.
- Barr, A., and Feigenbaum, E. (1981). *Handbook of artificial intelligence* (ed). Vol. 1, London: Pitman.
- Bates, M.J. (1979). Information search tactics. *Journal of the American Society for Information Science*, 30, 4, 205-214.
- Bawden, D., and Robinson, L. (2009). The Dark Side of Information: Overload, Anxiety and Other Paradoxes and Pathologies. *Journal of Information Science*, 35, 2, 180-191.
- Belkin, N. (1990). The Cognitive Viewpoint In Information Science. *Journal of Information Science*. Vol. 16, No. 1, 111-29

- Belkin, N. J. & Muresan, G. (2004). Measuring web search effectiveness: Rutgers at interactive TREC. Measuring web search effectiveness: The user perspectives. Workshop conducted at the meeting of WWW 2004, New York. Retrieved from <http://web.cs.dal.ca/~watters/www2004WorkShop/muresan-belkin.pdf>.
- Belkin, N.J., Brooks, H.M., and Oddy, R.N. (1982). Ask for information retrieval. *Journal of Documentation*, 38(2), 61-71.
- Belkin, N.J., Chang, S., Downs, T., Saracevic, T. and Zhao, S. (1990). Taking account of user task goals and behaviour for the design of online public access catalogue, In Henderson D. (Ed). *Proceedings of the 53rd ASIS Annual Meeting, Learned Information*, Medford, NJ, 69-79.
- Belkin, N.J. and Muresan, G. (2004). Measuring web search effectiveness: *Rutgers at interactive TREC. Measuring web search effectiveness: the user perspectives. Workshop conducted at the meeting of WWW 2004*, New York.
- Benn, Y., Webb, T.L., Chang, B.P. and Reidy, J. (2015), "What information do consumers consider, and how do they look for it, when shopping for groceries online?", *Appetite*, 89, 265-273.
- Bimber, B., Flanagin, A.J. and Stohl, C. (2005). Reconceptualizing Collective Action in the Contemporary Media Environment. *Communication Theory*., 365-388.
- Blackmon, M.H. (2012). Information scent determines attention allocation and link selection among multiple information patches on a webpage. *Behaviour and Information Technology*. Vol. 31. No. 1. 3-15.
- Blackmon, M.H., Kitajima, M. and Polson, P.G. (2005). Tool for Accurately Predicting Website Navigation Problems, Non-Problems, Problem Severity, and Effectiveness of Repairs. *Chi Letters, 7: Proceedings of CHI 2005*. New York: ACM Press.
- Blog Feedspot (2017). Top fifty Singapore food blogs. Retrieved from https://blog.feedspot.com/singapore_food_blogs/
- Bojko, A. (2006). Using eye tracking to compare web page designs: A case study. *Journal of Usability of Studies*, 3(1): 112-20.
- Borah, P. (2014). The hyperlinked world: A look at how the interactions of news frames and hyperlinks influence news credibility and willingness to seek information, *Journal of the Computer-Mediated Communication*, 19, 576-590.
- Borgman, C.L. (1986). The users mental model of an information-retrieval system – an experiment on a prototype online catalog. *International Journal of Man-Machine Studies*, 24(1), 47-64.
- Borgman, C., Hirsh, S.G. and Hiller, J. (1996). Rethinking online monitoring methods for information retrieval systems; from search product to search process. *Journal of the American Society for Information Science*, 47,7, 568-583.

- Borlund, P. (2003). The concept of relevance in information retrieval. *Journal of the American Society for Information Science and Technology*, 54, 10, 913-925.
- Borlund, P., and Dreier, S. (2014). An investigation of the search behaviour associated with Ingwersen's three types of information needs. *Information Processing & Management*, 50,4, 493-507.
- Borlund, P. and Ingwersen, P. (1997). The development of a method for the evaluation of interactive information retrieval systems. *Journal of Documentation*, 53, 3,2 25-250
- Brehm, J. and Brehm, S. (1981). *Psychological reactance: a theory of freedom and control*. New York. Academic Press.
- Bryman, A. (2007). Barriers to integrating quantitative and qualitative research. *Journal of Mixed Methods Research*, 1, 8
- Bryman, A. (2008). *Social Research Methods* (3rd ed). New York: Oxford University Press.
- Budiu, R. and Pirolli, P.L. (2007). Modeling Navigation in Degree of Interest Trees. In 29th Meeting of the Cognitive Science Society, August 1-4, 2007. Nashville, TN, USA.
- Burgoon, J.K. and Saine, T. (1978). *The Unspoken Dialogue: An Introduction to Nonverbal Communication*. Boston. Houghton Mifflin Company.
- Burnett, G., and Jaeger, P.T. (2011). The Theory of Information Worlds and Information Behaviour. In Spink, A., Heinström, J. (ed.). *New Directions in Information Behaviour*. Library and Information, 161-180. Emerald Group Publishing Limited.
- Bystrom, K. (2002). Information and information sources in tasks of varying complexity. *Journal of the American Society for Information Science and Technology*, 53, 7, 581-591.
- Bystrom, K. (2011). Information and information sources in tasks of varying complexity. *Journal of the American Society of Information and Technology*, 53, 7, 581-591.
- Bystrom, K., and Hansen, P. (2005). Conceptual framework for task in information studies. *Journal of the American Society for Information Science and Technology*, 56, 10, 1050-1061.
- Bystrom, K. and Jarvelin, K. (1995). Task complexity affects information seeking and use. *Information Processing & Management*, 31(2), 191-213.
- Cambridge Dictionary online (2015). Forage. Retrieved from <http://dictionary.cambridge.org/dictionary/english/forage>
- Campbell, D.J. (1988). Task complexity: a review and analysis. *Academy of Management Review*, 13, 1, 40-52.
- Card, S.K., Pirolli, P., Van Der Wege, M., Morrison, J.B., Reeder, R.W., Schraedley, P.K., and Boshart, J. (2001). Information Scent as a Driver of Web Behaviour Graphs: Results

- of a Protocol Analysis Method for Web Usability. In *Proceedings of the SIG-CHI on Human Factors in Computing Systems*. March 31-April 5, 2001, Seattle, Washington. ACM
- Case, D.O. (2012). *Looking for Information – A Survey of Research on Information Seeking, Needs, and Behavior* (3rd ed). Library and Information Science.
- Cennamo, K. S. (1993). Learning from video: Factors influencing learners' preconceptions and invested mental effort. *Educational Technology Research and Development*, 41(3), 33–45.
- Cennamo, K. S. (1992). Students' perceptions of the ease of learning from computers and interactive video: An exploratory study. *Journal of Educational Technology Systems*, 21(3), 251–263.
- Catledge, L.D. and Pitkow, J.E. Characterizing Browsing Strategies in the World Wide Web. *Computer Networks and ISDN Systems*, 27(6), 1065-1073.
- Chaiken, S. (1980). Heuristic versus systematic information processing and the use of source versus message cues in persuasion. *Journal of Personality and Social Psychology*, 39(3), 752-766.
- Chatman, E.A. (1996). The Impoverished Life-World of Outsiders. *Journal of the American Society for Information Science*. 47, 193-206.
- Chatman, E.A. (1999). Life in a Small World: Applicability of Gratification Theory to Information-Seeking Behavior. *Journal of the American Society of Information Science*. 42:6. ABI/INFORM Global.
- Chatman, E.A. (2000). Framing Social Life in Theory and Research. *The New Review of Information Behaviour Research*. 1, 3-17.
- Chen, Q., & Wells, W. D. (1999). Attitude toward the site. *Journal of Advertising Research*, 39(5), 27e37.
- Chen, J.V., Lin. C., Yen, D.C. and Linn, K.P. (2011). The interaction effects of familiarity, breadth and media usage on web browsing experience. *Computers in Human Behavior*, 27, 2141-2152.
- Chevalier, A., Maury, A.C. and Fouquereau, N. (2014). The influence of search complexity and the familiarity with the website on the subjective appraisal of aesthetics, mental effort and usability. *Behaviour & Information Technology*, 33, 2, 117-132.
- Chi, E. H., Rosien, A., Suppattanasiri, G., Williams, A., Royer, C., Chow, C., Robles, E., Dalal, Chen, J. and Cousins, S. (2003). The Bloodhound Project: Automating discovery of Web usability issues using the InfoScent simulator. CHI 2003, *ACM Conference on Human Factors in Computing Systems*, CHI Letters, 5, 505-512.

- Choi, Y. (2010). Effects of contextual factors on image searching on the web. *Journal of the American Society for Information Science and Technology*, 61(10).
- Choi, Y; and Rasmussen, E. (2002). User's relevance criteria in image retrieval in American history. *Information Processing & Management*, 38(5), 695-726.
- Choi, W. and Stvilia, B. (2015). Web credibility assessment: conceptualization, operationalization, variability, and models. *Journal of the Association for Information Science and Technology*, 66(12), 2399-2414.
- Chowdhury, S.G., Gibb., F. and Landoni, M. (2011). Uncertainty in Information Seeking and Retrieval: A Study in an Academic Environment. *Information Processing & Management*, 47(2), 157-175.
- Christensen, H. and Griffiths, K. (2000). The Internet and mental health literacy. *Australian and New Zealand Journal of Psychiatry*, 34:975-979.
- Cohen, J.A. (1960). A coefficient of agreement for nominal scales. *Educational Psychology Measurement*, 20, 37-46.
- Collins-Thompson, K., Rieh, S.Y., Haynes, C.C. and Syed, R. (2016). *Assessing learning outcomes in web search: A comparison of tasks and query strategies*. Proceedings of the 2016 ACM on Conference on Human Information Interaction
- Coltekin, A. Fabrikant, S.I. and Lacayo, M. (2010). Exploring the efficiency of users' visual analytics strategies based on sequence analysis of eye movement recordings. *International Journal of Geographical Information Science*, 24(10), 1559-1575.
- Cuddihy, E. and Spyridakis, J.H. (2012). The effect of visual design and placement of intra-article navigation schemes on reading comprehension and website use perceptions. *Computers in Human Behavior*. 28, 1399-1409.
- Cutmore, T.R.H., Trevor, J.H., Kerry, J.M., Nicole, M.L and Hawgood, G. (2000). Cognitive and gender factors influencing navigation in a virtual environment. *International Journal of Human-Computer Studies*, 53, 223-249.
- Creswell, J.W. and Plano Clark, V.L. (2007). *Designing and conducting mixed methods research*, p. 7. Thousand Oaks, CA: Sage
- Cutrell, E. and Guan, Z. (2007). What are you looking for? An eye-tracking study of information usage in Web search. In *Proceedings of the SIGCHI conference on Human factors in computing systems*. San Jose, California, USA.
- Cyr, D., Bonanni, C. Bowes, J. and Ilsever, J. (2005). Beyond trust: Website design preferences across cultures. *Journal of Global Information Management*, 13, 4, 24-52.
- Dailey, L. (2004). Navigational web atmospherics- Explaining the influence of restrictive navigation cues. *Journal of Business Research*, 37, 795-803.

- Davis, S.H. (2007). Bridging the gap between research and practice: What's good, what's bad, and how can one be sure? *Phi Delta Kappan*, 88(8), 569-578.
- Denscombe, M. (2008). Communities of Practice : A research paradigm for the mixed methods approach. *Journal of Mixed Methods Research*, 2, 3, 272
- Denzin, N.K. (1970). *The Research Act: A Theoretical Introduction to Sociological Methods*. Chicago, Illinois: Aldine Publishing.
- Denzin, N.K. (1989). *Interpretive Interactionism* (2nd ed.) Thousand Oaks, CA: Sage
- Derr, R.L. (1983). A conceptual analysis of information need. *Information Processing & Management*, 19, 5, 273-278.
- Dervin, B. (1983). An overview of sense-making research: concepts, methods and results. In *Annual General meeting of the International Communication Association*, Dallas.
- Dervin, B. (1992). From the mind's eye of the user: the sense-making qualitative-quantitative methodology. In Glazier, J.D. and Powell, R.R. (Eds) *Qualitative Research in Information Management*, 61-84.
- Dervin, B. (2003a). Chaos, order, and sense-making. A proposed theory for information design. In B. Dervin, L. Foreman-Wernet, & E. Lauterbach (Eds), *Sense-making Methodology Reader: Selected writings of Brenda Dervin* (pp. 325-240). Cresskill, NJ: Hampton Press.
- Dervin, B. (2003b). From the mind's eye of the user: The sense-making qualitative-quantitative methodology. In B. Dervin Foreman-Wernet, & Lauterbach E. (Eds). *Sense-making methodology reader: Selected writings of Brenda Dervin* (pp.325-340). Cresskill, NJ: Hampton Press.
- Dervin, B., Jacobson, T.L and Nilan, M.S. (1982). Measuring Aspects of Information Seeking: A Test of a Quantitative/Qualitative Methodology. In Burgoon, M. (ed.). *Communication Yearbook 6*. Bervely Hills, CA: Sage, 419-444.
- Dolan P., Hallsworth, M., Halpern, D., King, D., and Vlaev, D. (2010). *Mindspace: Influencing behaviour through public policy*. London, UK. Cabinet Office.
- Dimitroff, A. (1992). Mental models theory and search outcome in a bibliographic retrieval system. *Library & Information Science Research*, 14(2), 141-156.
- Duchowski, A.T. (2007). *Eye Tracking Methodology: Theory & Practice* (2nd ed). London: Springer-Verlag.
- Duck, J.M., Terry, D.J. and Hogg, M.A. (1995). The perceived influence of AIDS advertising: third-person effects in the context of positive media content. *Basic and Applied Social Psychology*, 17, 305-325.

- Duggan, G.B. and Payne, S.J. (2009). Text skimming: The process and effectiveness of foraging through text under time pressure. *Journal of Experimental Psychology – Applied*, 15, 3, 228-242.
- Dwairy, M., Dowell, A.C. and Stahl, J-C. (2011). The Application of Foraging Theory to the Information Searching Behaviour of General Practitioners. *BMC Family Practice*. Retrieved from <http://www.biomedcentral.com/1471-2296/12/90>.
- Eagly, A.H. and Chaiken, S. (1993). *The Psychology of Attitudes*. Orland, FL, US: Harcourt Brace Jovanovich College Publishers.
- Ellis, D. (1989) A Behavioural Approach to Information Retrieval Design. *Journal of Documentation*. 49(3), 171-212.
- Ellis, D., Cox, D. and Hall, K. (1993). A comparison of the information seeking patterns of researchers in the physical and social sciences. *Journal of Documentation*, 49, 4, 356-369.
- Ellis, D. and Haugan, M. (1997). Modelling the information seeking patterns of engineers and research scientists in an industrial environment. *Journal of Documentation*, 53, 4, 384-403.
- Ellison, S.L.R. and Barwick, V. J. and Farrant, T.J.D. (2009). *Practical Statistics for the Analytical Scientist – A Bench Guide*. (2nd ed). RSC Publishing, Cambridge.
- Epplier, M.J. and Mengis, J. (2004). The Concept of Information Overload: A Review of Literature from Organization Science, Accounting, Marketing, MIS, and Related Disciplines. *The Information Society*, 30, 325-344.
- Eraslan, S., Yesilada, Y. and Harper, S. (2016). Eye tracking scanpath analysis techniques on web pages: a survey, evaluation and comparison. *Journal of Eye Movement Research*. 9(1), 2, 1-19.
- Esquivel, A., Meric-Bernstam, F., & Bernstam, E. (2006). Accuracy and self correction of information received from an Internet breast cancer list: Analysis of posting content. *British Medical Journal*, 332, 939-942.
- Fadel, K.J., Meservy, T.O. and Jensen, M. L. (2015). Exploring knowledge filtering processes in electronic networks of practice. *Journal of Management Information Systems*, 31, 4, 158-181.
- Ferguson, T. (2007). *e-Patients: How they can help as heal healthcare*. Retrieved from http://www.ePatients.net/e-Patients_White_Paper.pdf
- Field, A. (2013). *Discovering Statistics with IBM SPSS*. Newbury Park, CA: Sage.
- Fink-Shamit, N. and Bar-Ilan, J. (2008). Information quality assessment on the Web – an expression of behaviour. *Information Research*, 13(4), 357. Retrieved from <http://InformationR.net/ir/13-4/paper357.html>

- Fisher, B.F., McKemmish, S., Manaszewicz, R. and Malhotra, R. (2005). User centered quality health information provision: benefits and challenges. *Proceedings of the 38th Hawaii International Conference on System Sciences*. IEEE.
- Flad, J. A. (2002). The effects of increasing cognitive load on self-report and dual-task measures of mental effort during problem solving. Unpublished doctoral dissertation. University of Southern California.
- Flanagin, A.J. and Metzger, M.J. (2001). Internet Use in the Contemporary Media Environment. *Human Communication Research*, Vol. 27, No. 1. *International Communication Association*.
- Fogg, B.J. (2003). *Persuasive technology: using computers to change what we think and do*. San Francisco. CA: Morgan Kaufmann Publishers.
- Fogg, B.J., Soohoo, C. and Danielson, D. (2002). How people evaluate a website's credibility? Results from a larger study. *Persuasive Technology Lab*. Stanford University. Retrieved from www.consumerwebwatch.org/news/report3_credibilityresearch/stanfordPTL.pdf.
- Fogg, B.J., Soohoo, C., Danielson, D.R., Marable, L., Stanford, J. and Tauber, E.R. (2003). How do users evaluate the credibility of Websites? A Study with over 2500 participants. In *Proceedings of the 2003 conference on designing for user experiences (DUX'03)*.
- Fogg, B.J. and Tseng, H. (1999). The elements of computer credibility. *Proceedings of CHI'99, Human Factors in Computing Systems*, 80-87
- Ford, N. (2005). New Cognitive Directions. In Spink, A., and Cole, C. (eds). *New Directions in Cognitive Information Retrieval*, 81-96. Springer. Netherlands.
- Fox, F.E., Morris M. and Rumsey, N. (2007). Doing synchronous online focus groups with young people: Methodological reflections. *Qualitative Health Research*, 17, 539-547.
- Fraser, L. and Locatis, C. (2001). Effects of link annotations on search performance in layered and unlayered hierarchically organized information spaces. *Journal of the American Society for Information Science & Technology*, 52, 14, 1255 – 1261.
- Frey, D. (1986). Recent Research on Selective Exposure to Information. In Berkowitz, L. (ed.), *Advances in Experimental Social Psychology*, Vol. 19, 41-80, New York: Academic Press.
- Frost, C.O., Taylor, B., Noakes, A., Markel, S., Torres, D., and Drabenstott, K.M. (2000). Browse and search patterns in a digital image database. *Information Retrieval*, 1, 4, 287-313.
- Fu, W.T. and Pirolli, P. (2007). SNIF-ACT: A cognitive model of user navigation on the World Wide Web. *Human-Computer Interaction*, 22, 355-4.12.

- Gao, Y; and Wu, X. (2010). A cognitive model of trust in e-commerce: Evidence from a field study in China. *Journal of Applied Business Research*, 26, 1, 37-44.
- Garett, J.J. (2003). *The Elements of User Experience: User-centered Design for The Web*. Indiana, New Riders Publications.
- Gattis, L. (2002). Planning and information foraging theories and their value to the novice technical communicator. *ACM Journal of Computer Documentation*, 26(4), 168-175.
- Ge, X. and Land, S.M. (2003). Scaffolding students' problem-solving processes in an ill-structured task using question prompts and peer interactions. *Educational Technology Research and Development*, 51(1), 21-38.
- Gerwe, P. and Viles, C.L. (2000). User effort in query construction and interface selection. In *Proceedings of 5th ACM Conference on digital libraries*, 246-247.
- Gigerenzer, G. and Goldstein, D.G. (1996). Reasoning the fast and frugal way: Model of bounded rationality. *Psychological Review*, 103, 650-669.
- Goldberg, J.H. and Kotval, X.P. (1999). Computer interface evaluation using eye movements: methods and constructs. *International Journal of Industrial Ergonomics*, 24, 631-645.
- Goldberg, J.H., Stimson, M.J., Lewenstein, M., Scott, N. and Wichansky, A.M. (2002). Eye tracking in Web search task: design implications: In *Proceedings of the 2002 Symposium on Eye Tracking Research & Applications*, 51-58. New York: ACM Press
- Goodrum, A., Bejune, M. and Siochi, A.C. (2003). A state transition analysis of image search patterns on the Web. In *Proceedings of the Second International Conference Image and Video Retrieval (CIVR)*, 281-290, Berlin, Germany: Springer.
- Granka, L.A., Joachims, T. and Gay, G. (2004). Eye-tracking analysis of user behaviour in WWW search. *SIGIR '04*, July 25-29. Sheffield, South Yorkshire, UK. ACM 1-58113-881-4/04/0007.
- Griffith, T.L. (1999). Technology Features as Triggers for Sensemaking. *Academy of Management*. Vol. 24, No. 9, 472-488.
- Guan, Z., Lee, S., Cuddihy, E. and Ramey, J. (2006). The validity of the stimulated retrospective think-aloud method as measured by eye tracking. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 1253-1262. ACM.
- Gunther, A.C. (1988). Attitude extremity and trust in media. *Journalism Quarterly*, 65, 279-287.
- Gwizdka, J. and Spence, I. (2006). What can searching behaviour tell us about the difficulty of information tasks? A study of web navigation. *Proceedings of the American Society for Information Science and Technology*, 43(1), 1-22.

- Hackos, J. and Redish, J. (1998). *User and task analysis for interface design*. New York: Wiley.
- Halasz, F.G. and Moran, T.P. (1983). Mental models and problem-solving in using a calculator. In *Proceedings of CHI '83 human factors in computing system*, 212-216.
- Hamid, R.A., Thom J.A. and Iskandar, DNF A. (2017). Effects of relevance criteria and subjective factors on web image searching behaviour. *Journal of Information Science*, 43, 6, 786-800.
- Hansen, P. (1999). User interface design for IR interaction. A task-oriented approach. In Aparac, T., Saracevic, T., Ingwersen, P., & Vakkari, P. (eds), *Digital Libraries: Interdisciplinary concepts, challenges and opportunities. Proceedings of the Third International Conference on the Conceptions of the Library and Information Science (CoLIS 3)*, 191-205.
- Hasan, B. (2016). Perceived irritation in online shopping: The impact of website design and characteristics. *Computers in Human Behavior*, 54, 224-230.
- Hargittai, E., Fullerton, L., Menchen-Trevino, E. and Thomas, K.Y. (2010). Trust online: Young adults' evaluation of web content. *International Journal of Communication*, 4, 468-494.
- Hearst, M.A. (2009). *Search User Interfaces*. Cambridge University Press.
- Henderson, J.M. and Ferreira, F. (2004). Scene perception for psycholinguistics. In: Henderson, J.M. & Ferreira (eds). *The Interface of Vision, Language, and Action. Eye Movements and the Visual World*. New York, New York: Psychology Press. 1-58.
- Hesse-Biber, S. and Griffin, A. J. (2013). Internet-mediated technologies and mixed methods research: Problems and Prospects. *Journal of Mixed Methods Research*, 7, 1, 43-61.
- Hesse-Biber, S. and Johnson, R.B. (2012). Coming at things differently: Future directions of possible engagement with mixed methods research. *Journal of Mixed Methods Research*, 7, 2, 103-109.
- Heurta, E. (2003). The credibility of online information. *Doctoral dissertation*. Claremont Graduate University.
- Hills, T. T., Jones, M. N. and Todd, P. M.(2012). Optimal foraging in semantic memory. *Psychology Review*, 119, 431-440
- Hilligoss, B. and Rieh, S.Y. (2008). Developing a unifying framework of credibility assessment: Construct, heuristics, and interaction in context. *Information Processing and Management*, 44(4), 1467-1484.
- Himmelboim, I. (2010). The international network structure of news media: An analysis of hyperlinks usage in news web sites. *Journal of Broadcasting and Electronic Media*, 54(3), 373-390

- Hofacker, C.F. and Murphy, J. (2000). Clickable World Wide Web, banner ads and content sites. *Journal of Interactive Marketing*, 14, 1. 49-59.
- Hodkinson, C., Kiel, G., McColl-Kennedy, J.R. (2000). Consumer web search behaviour: diagrammatic illustration of wayfinding on the web. *International Journal of Human-Computer Studies*, 52(5), 805-830.
- Hoffman, D.L. and Novak, T.P. (1977). *Marketing in hypermedia computer-mediated environments: Conceptual foundations*, J Mark, 60,50-68.
- Hoffman, D.L. and Novak, T.P. (1996). Marketing in hypermedia computer-mediated environments: conceptual foundations. *Journal of Marketing*, 60, 50-68.
- Hogarth, R.M. (1987). *Judgement and Choice: The Psychology of Decision*, 2nd ed. New York: John Wiley & Sons.
- Holscher, C. and Strube, G. (1999). Searching on the Web: Two types of expertise. *Proceedings of SIGIR '99; 22nd International Conference on Research and Development in Information Retrieval*. University of California, Berkeley, 305-306.
- Holscher, C. and Strube, G. (2000). Web search behaviour of internet experts and newbies. *Computer Networks: The International Journal of Computers and Telecommunications Networking*, 33, 337-346.
- Hou, J. (2017). Can interface cues nudge modelling of food consumption? Experiments on food-ordering websites. *Journal of Computer-Mediated Communication*, 22, 196-214.
- Hovand, C.I., Lumsdaine, A.A. and Sheffield, F.D. (1949). *Experiments on Mass Communication*. Princeton, NJ: Princeton University Press.
- Howell, D.C. (2002). *Statistical Methods for Psychology (5th ed)*. Pacific Grove CA: Duxbury.
- Hsieh, T.L., Lo, H.H., Hu, H.H. and Chang, C.C. (2015), “The effect of information design on cognitive processing of website navigation”, *Human Factors and Ergonomics in Manufacturing & Service Industries*, 25, 5, 548-558.
- Hsieh-Yee, I. (1993). Effects of search experience and subject knowledge on the search tactics of novice and experienced searchers. *Journal of the American Society for Information Science*, 44,3, 161-174.
- Hu, R., Lu, K. and Joo, S. (2013). Effects of topic familiarity and search skills on query reformulation behaviour. *In Proceedings of ASSIST*, Montreal, Quebec.
- Hughes B., Wareham, J., and Joshi, I. (2010). Doctors’ Online Information Needs, Cognitive Search Strategies, and Judgements of Information Quality and Cognitive Authority: How Predictive Judgements Introduce Bias into Cognitive Search Models. *Journal of the American Society for Information Science and Technology*. 61(3), 433-452.

- Hyener, R. H. (1985). Some guidelines for the phenomenological analysis of interview data. *Human Studies*, 8, 279-303.
- Ihadjadene, M., Chaudiron, S. and Martin, D. (2003). The effect of individual differences in searching the web. In *Proceedings of the 66th Annual Meeting of the American Society for Information Science and Technology*, Long Beach, 240-246.
- Impicciatore, P., Pandolifini, C., Casella, N. and Bonati, M. (1997). Reliability of health information for the public on the world wide web: Systematic survey of advice on managing fever in children at home. *British Medical Journal*, 314, 1875-1881.
- Ingwersen, P. (1992). *Information retrieval interaction*. London: Taylor Graham.
- Ingwersen, P. and Jarvelin, K. (2005). *The Turn: Integration of Information Seeking and Retrieval and Context*. Dordrecht, Netherlands: Springer.
- Irwin, E. (2004). Fixation location and fixation duration as indices of cognitive process. In: Henderson, J.M., and Ferreira (eds.) *The Interface of Vision, Language, and Action, Eye Movements and the Visual World*. New York, Psychology Press. 105-34.
- Jacob, R. and Karn, K. (2003). Eye tracking in human-computer interaction and usability research: ready to deliver the promises. In Hyona, J., Radach, R. and Deubel, H., eds. *The Mind's Eyes Cognitive and Applied Aspects of Eye Movement Research*. Amsterdam: Elsevier, 573-605.
- Jansen, B.J., Booth, D.L. and Spink, A. (2008). Determining the informational, navigational, and transactional intent of Web queries. *Information Processing and Management*, 44, 1251-1266. ScienceDirect
- Jarvelin, K. and Ingwersen, P. (2000). A user-oriented interface for generalised informetric analysis based on applying advanced data modelling techniques. *Journal of Documentation*, 56(3), 250-278.
- Jarvelin, K., Vakkari, P., Arvola, P., Baskaya, F., Jarvelin, A., Kekalainen, J., Keskustalo, H., Kumpulainen, S., Saastamoinen, M., Savolainen, R. and Sormunen, E. (2015). Task-based information interaction evaluation: the viewpoint of program theory. *ACM Transactions on Information Systems*, 33(1), 3.
- Jason, L.A. and Glenwick, D.S. (2012). *Methodological Approaches to Community-Based Research*. Washington, DC: American Psychological Association.
- Josephson, S. and Holmes, M.E. (2002). Visual attention to repeated Internet images: Testing the scanpath theory on the World Wide Web. In *Proceedings of the 2002 Symposium on Eye Tracking Research & Applications*, 43-51.
- Johnson, E.J., Bellman, S., and Lohse, J. (2003). Cognitive lock-in and the power law of practice. *Journal of Marketing*, 67, 2, 62-75.

- Johnson, R.B., and Onwuegbuzie, A.J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, 33, 14-26.
- Joinson, A.N. (2005). Internet behaviour and the design of virtual methods. In Hine, C. (Eds). *Virtual methods: Issues in social research on the Internet*, 21-34. Oxford, England: Berg
- Ju, B. (2007). Does domain knowledge matter: Mapping users' expertise in their information interactions. *Journal of the American Society for Information Science and Technology*, 58, 13, 2007-2020.
- Just, M.A. and Carpenter, P.A. (1976). Eye fixations and cognitive processes. *Cognitive Psychology*. Vol. 8, 4, 441-80.
- Juvina, I. and van Oostendorp, H. (2004). Individual differences and behavioural aspects involved in modeling web navigation. *Lecture Notes in Computer Science* 3196, 77-95.
- Kalyanaraman, S., and Ivory, J.D. (2009). Enhance Information Scent, Selective Discounting, or Consummate Breakdown: The Psychological Effects of Web-Based Search Results. *Media Psychology*. 12:3, 295-319.
- Karlgén, J. and Hansen, P. (2003). Cross-language relevance assessment and task context. In Peters, C., Braschler, M., Gazalo, J; and Kluck, M. (Eds). *Advances in Cross-Language Information Retrieval: Lecturer Notes in Computer Science*, LNCS 2785, 383, 391.
- Kari, J., and Savolainen, R. (2003). Towards a Contextual Model of Information Seeking on the Web. *The New Review of Information Behaviour Research*.
- Katsanos, C., Tselios N. and Avouris, N. (2006). InfoScent evaluator: a semi-automated tool to evaluate semantic appropriateness of hyperlinks in a web site. In *Proceedings of OZCHI 2006*, Sydney, Australia, 373-376. ACM Press, New York.
- Katz, M.A. and Byrne, M.D. (2002). Effects of Scent and Breadth on Use of Site-Specific Search on E-Commerce Web Sites. *ACM Transactions on Computer-Human Interaction*. Vol. 10, No. 3. 198-220
- Kekailainen, J. and Jarvelin, K. (2002). Using graded relevance assessments in IR evaluation. *Journal of the American Society for Information Science and Technology*, 53, 13, 1120-1129.
- Kelly, D. (2006a). Measuring online information seeking context, Part 1: Background and method. *Journal of the American Society for Information Science and Technology*, 57, 13, 1729-1739.
- Kelly, D. (2006b). Measuring online information seeking context, Part 2: Findings and Discussion. *Journal of the American Society for Information Science and Technology*, 57, 14, 1862-1874.

- Kelly, D. (2009). Methods for evaluating interactive information retrieval systems with users. *Foundations and Trends in Information Retrieval*, 3, 1-2 , 1-224.
- Kelly, D. and Cool., C. (2002). The effects of topic familiarity on information search behaviour. In *Proceedings of Joint Conference on Digital Libraries (ICDI)*, 13-17 July, Portland.
- Khan, K. and Locatis, C. (1998). Searching through cyberspace, the effects of link cues and correspondence on information retrieval from hypertext on the world wide web. *Journal of the American Society for Information Science*, 49, 14, 1248-1253.
- Khapre, S. and Saleem Basha, M.S. (2012). *Advancement in Information Foraging Theory. Intelligent Information Management*, 4, 383-389.
- Kiesler, S. and Spoull, L. (1982). Managerial Response to Changing Environments: Perspectives on Problem Sensing from Social Cognition. *Administrative Science Quarterly*, 27, 548-570.
- Kim, J. (2006). Task difficulty as a predictor and indicator of web searching interaction. *CHI '06*, 959-964.
- Kim, K.S. and Allen, B. (2002). Cognitive and task influences on web searching behavior. *Journal of the American Society for Information Science and Technology*, 53(2): 109-119.
- Kim, H. and Hirtle, S.C. (1995). Spatial Metaphors and Disorientation in Hypertext Browsing. *Behaviour and Information Technology*. 14, 239-250.
- Kim, H., Xiang, Z., and Fesenmaier, D.R. (2015). Use of internet for trip planning: A generational analysis. *Journal of Travel & Tourism Marketing*, 32, 276-289.
- Ko, H.C. (2012). Why are A-list bloggers continuously popular? *Online Information Review*, 3, 36, 401-419.
- Kolbe, R.H. and Burnett, M.S. (1991). Content-analysis research: An examination of application with directives for improving research reliability and objectivity. *Journal of Consumer Research*, 18, 243-250.
- Krassanakis, V., Filippakopoulou, V. and Nakos, B. (2014). EyeMMV toolbox: An eye movement post-analysis tool based on a two-step spatial dispersion threshold for fixation identification. *Journal of Eye Movement Research*, 7(1), 1, 1-10.
- Krippendorff, K. (1980). *Content Analysis, An Introduction to Its Methodology*. Newbury Park, CA: Sage Publications.
- Kuhlthau, C.C. (1991). Inside the Search Process: Seeking Meaning From the Users Perspective. *Journal of the American Society for Information Science*, 42(5), 361-371.
- Kuhlthau, C.C. (1993). A principle of uncertainty for information seeking. *Journal of Documentation*, 49, 4, 339-355.

- Kuhlthau, C.C. (2004). *Seeking Meaning: A Process Approach to Library and Information Services*, 2nd ed. Greenwood Press, Westport, CT.
- Kumpulainen, S. (2013). Task-based information access in molecular medicine: task performance, barriers, and searching within a heterogeneous information environment. *Doctoral Thesis*, Tampere University Press, Acta Universitatis Tamperensis: 1879.
- Kumpulainen, S. and Jarvelin, K. (2010). Information interaction in molecular medicine: integrated use of multiple channels. In *Proceedings of the 3rd Symposium on Information Interaction in Context (IIIX'10)*, ACM, New York.
- Lazard, A. and Mackert, M. (2014). User evaluations of design complexity: the impact of visual perceptions for effective online health communication. *International Journal of Medical Informatics*, 83(10), 726-735.
- Lazonder, A.W. (2000). Exploring Novice Users' Training Needs in Searching Information on the WWW. *Journal of Computer Assisted Learning*, 16, 326-336.
- Lazonder, A.W., Biemans, H.J.A. and Wopereis, I. (2000). Differences Between Novice and Experienced Users in Searching Information on the World Wide Web. *Journal of the American Society for Information Science*. 51(6), 576-581.
- Lowrance, N. and Moulaison, H.L. (2014). Skimming comprehension in two online document presentation environments. *Library Hi Tech*, 32, 3, 382-396.
- Lee, E.J. and Shin, S.Y. (2014). When do consumers buy online product reviews? Effects of review quality, product type, and reviewer's photo. *Computers in Human Behavior*, 31, 356-366.
- Lee H. and Pang N. (2014). Responding to haze: information cues and incivility in the online small world. In *Proceedings of ISIC, the Information Behaviour Conference*, Leeds, 2-5 September, 2014: Part 1, (paper isic04). Retrieved from <http://InformationR.net/ir/19-4/isic/isic04.html> (Archived by WebCite® at <http://www.webcitation.org/...>)
- Lewins, A., Taylor, C. and Gibbs, G. (2005). *What is Qualitative Analysis?* School of Human & Health Sciences, University of Huddersfield. United Kingdom.
- Lindgaard, G., Fernandes, G., Dudek, C., and Brown, J. (2006). Attention web designers: you have 50 ms to make a good first impression. *Behaviour and Information Technology*, 25, 2, 115-126.
- Liu, Z. (2004). Perceptions of credibility of scholarly information on the web. *Information Processing and Management*, 40, 1027-1038.
- Li, Y. (2009). Exploring the relationships between work task and search task in information search. *Journal of the American Society for Information Science and Technology*, 60(2), 275-291.

- Li, Y. and Belkin, N.J. (2008). A faceted approach to conceptualizing tasks in information seeking. *Information Processing and Management*, 44, 1822-1837.
- Liu, J. and Belkin, N. J. (2014). Multi-aspect information use task performance: the roles of topic knowledge, task structure, and task stage. *ASIS&T*, Seattle, WA, USA.
- Liu, J., Chang, S.K. and Creel, C. (2015). Exploring search task difficulty reasons in different and user knowledge groups. *Information Processing and Management*, 273-285.
- Liu, P. and Li, Z. (2012). Task complexity: A review and conceptualization framework. *International Journal of Industrial Ergonomics*, 42, 553-568.
- Liu, J., Gwizdka, Liu, C. and Belkin, N.J. (2010). Predicting task difficulty for different task types. In *Proceedings for the Annual Conference of the American Society for Information Science & Technology (ASIS&T)*.
- Liu, J., Kim, C.S. and Creel, C. (2013). Why do users feel search task difficulty?, *Proceedings of the American Society for Information Science & Technology*, 50, 1, 1-4.
- Liu, J., Liu, C., Cole, M., Belkin, N.J. and Zhang, X. (2012). Examining and predicting search task difficulty. In *Proceedings of 14th International Conference on Information and Knowledge Management (CIKM) 2012*.
- Locke, E.A., Shaw, K.N. Saari, L.M. and Latham, G.P. (1981). Goal setting and task performance: 1969-1980. *Psychological Bulletin*, 90, 125-152.
- Lofland, J. and Lofland, L. (1995). *Analysing Social Settings: A Guide to Qualitative Observation and Analysis*, 3rd Ed, London, Wadsworth.
- Lombard, M., Synder-Duch, J., and Bracken, C.C. (2010). *Practical Resources for Assessing and Reporting Inter-coder Reliability in Content Analysis Research Projects*. Retrieved from http://matthewlombard.com/reliability/index_print.html
- Lorigo, L., Pan, B., Hembrooke, H., Joachims, T., Granka, L., & Gay, G. (2006). The influence of task and gender on search and evaluation behaviour using Google. *Information Processing & Management*, 42(4), 1123–1131.
- Louis, M.R., and Sutton, R. I. (1991). Switching Cognitive Gears: From Habits of Mind to Active Thinking. *Human Relations*. 44, 55-76.
- Luca, L., Stephen, B., and Piepaolo, D. (2009). Information Foraging Theory as a Form of Collective Intelligence for Social Search. In Nguyen, N.T., Kowalczyk, Chen, S.M. (eds). *ICCCI 2009*, LNAI 5796, 63-74. Springer-Verlag Berlin Heidelberg.
- Lucassen, T. and Schraagen, J.M. (2012). Propensity to trust and the influence of source and medium cues in credibility evaluation. *Journal of Information Science*, 38.6, 566-577.

- Lucassen, T. and Schraagen, J.M. (2013). Factual accuracy and trust in information: The role of expertise. *Journal of the American Society for Information Science and Technology*, 62(7), 1232-1242.
- Lucassen, T., Mullwijk, R., Noordzlj, M.L. and Schraagen, J.M. (2013). Topic familiarity and information skills in online credibility evaluation. *Journal of the American Society for Information Science and Technology*, 64, 2, 254-264.
- Luyt, R. (2016). A framework for mixing methods in quantitative measurement development, validation, and revision: A case study. *Journal of Mixed Methods Research*, 6, 4, 294-316.
- Lynch, C.A. (2001). When documents deceive: Trust and provenance as new factors for information retrieval in a tangled web. *Journal of the American Society for Information Science and Technology*, 52, 1, 12-17.
- Marchionini, G. (1995). *Information seeking in electronic environments*. New York: Cambridge University Press.
- Marchionini, G. (2006). Exploratory search: From finding to understanding. *Communications of the ACM*, 49,4, 41-46.
- Madden, A.D., Ford, N.J., Miller, D., and Levy, P. (2006). Children's Use of the Internet of Information-Seeking. What Strategies Do They Use, and What Factors Affect Their Performance? *Journal of Documentation*, 62, 744-761.
- Marchionini, G., and Shneiderman, B. (1988). Finding facts vs browsing knowledge in hypertextual systems, *IEEE Computer*, 2 (1), 70-80.
- Marchionini, G., Meadow, C., Dwiggins, S., Liu, X., Wang, J. and Yuan, W. (1991). A study of user interaction with information retrieval interfaces: progress report. *The Canadian Journal of Information Science*, 16(4), 42-59.
- Markey, K. (2007). Twenty-five years of end-user searching. Part 1: Research findings. *Journal of the American Society for Information Science & Technology*, 58, 1071-1081.
- Markham, A. (2005). The Methods, Politics, and Ethics of Representation in Online Ethnography. In Denzin, N. and Lincoln (eds). *The Sage Handbook of Qualitative Research* (3rd ed). 793-820.
- McCart, J.A., Pandmanabhan, B. and Berndt, D.J. (2013). Goal attainment on long tail web sites: an information foraging approach, *Decision Support Systems*, 55, 235-246.
- McKemmish, S., Manaszewicz, R., Burstein, F., and Fisher, J. (2009). Consumer empowerment through metadata-based information quality reporting: The breast cancer knowledge online portal. *Journal of the American Society for Information Science and Technology*, 60, 9, 1792-1807.

- Meadow, C., Wang, J., and Yuan, W. (1995). A study of user performance and attitudes with information retrieval interfaces. *Journal of the American Society for Information Science*, 46, 7, 490-505.
- Metzger, M.J. (2007). Making sense of credibility on the Web: models for evaluating online information and recommendation for future research. *Journal of the Association for Information Science and Technology*, 58(13), 2078-2091.
- Metzger, M.J., Flanagin, A.J., Eyal, K., Lemus, D.R. and McCann, R.M. (2003). Credibility for the 21st century: integrating perspectives on source, message, and media credibility in the contemporary media environment. In Kalbfleish, P.J. (Ed.). *Communication Yearbook*, 27, 293-333, Mahwah, NJ: Lawrence Erlbaum Associates Inc.
- Miles, M.B., Huberman, A.M. and Saldana, J. (2014). *Qualitative Data Analysis: A Methods Sourcebook*, 3rd Edition, Sage.
- Mizzaro, S. (1998). How many relevances in information retrieval? *Interacting With Computers*, 10, 3, 305-322.
- Monchaux, S., Amadieu, F., Chevalier, A. and Marine, C. (2015). Query strategies during information searching: effects of prior domain knowledge and complexity of the information problems to be solved. *Information Processing & Management*, 51, 557-569.
- Mchlugh, M.L. (2012). Interrater reliability: the kappa statistic. *Biochemia Medica*. Retrieved from www.ncbi.nlm.nih.gov/pmc/articles/PMC3900052/
- Miller, C.S., and Remington, R.W., (2004). Modeling information navigation: implications for information architecture. *Human-Computer Interaction*, 19, 225-271.
- Nahl, D. (2007). The Centrality of the Affective in Information Behavior. In Nahl, D., and Bilal, D. (eds). *Information and Emotion. The Emergent Affective Paradigm in Information Behavior Research and Theory*, pp. 3-37. Medford, N.J. Information Today, Inc.
- Napoli P.N. (2008). Hyperlinking and the Forces of 'Massification'. In Turow, J. and Tsui, L. (2011). *The Hyperlinked Society: Questioning Connections in the Digital Age*. Ann Arbor, MI: University of Michigan Press. 56-69.
- Navarro-Prieto, R., Scaife, M., and Rogers, Y. (1999). Cognitive Strategies in Web Searching. *Proceeding of the 5th Conference on Human Factors and the Web* (pp. 43-56). Gaithersburg, Maryland.
- Neuendorf, K.A. (2002). *The Content Analysis Guidebook*. Sage Publications.
- Nicholar, D., Huntington, P., Jamali, H.R., and Dobrowolski, T. (2007). *Characterising and evaluating information seeking behaviour in a digital environment: Spotlight on the 'bouncer'*, 43, 1085-1102

- Nielsen, J. (2001). *Designing for Web Usability*. Indiana: New Riders Publications.
- Nielson, J. and Pernice, K. (2010). *Eyetracking Web Usability*. New Riders.
- Norman, D.A. (1983). Some observations on mental models. In Gentner, D. & Stevens, A.L. (eds). *Mental Models*, 7-14.
- Nunnally, J.C. (1978). *Psychometric Theory*. New York. McGraw-Hill.
- Olston, C. and Chi, E.H. (2003). Scent Trails: Integrating Browsing and Searching On the Web. *ACM Transactions on Computer-Human Interaction*, 10, 177-197.
- Otter, M. and Johnson, H. (2000). Lost in hyperspace: metrics and mental models. *Interacting with Computers*, 13, 1-40.
- Ozmen, M.U. (2015). Online information retrieval behaviour and economics of attention. *Online Information Retrieval*, 39, 6, 779-794.
- Pan, B. and Fesenmaier, D.R. (2006). Online Information Search – Vacation Planning Process. *Annals of Tourism Research*, Vol. 33, No. 3, 809-832.
- Pan, B., Hembrooke, Gay, H., Granka, L., Feusner, M. and Newman, J. (2004). The determinants of Web page viewing behaviour: an eye-tracking study. In *Proceedings of the 2004 Symposium on Eye tracking Research and Applications*, 147-154. New York ACM Press.
- Pan, B., Hembrooke, H., Joachim, T., Lorigo, L., Gay, G. and Granka, L. (2007). In Google we trust: users' decisions on rank, position, and relevance. *Journal of Computer-Mediated Communication*, 12, 801-823.
- Pang, N (2011). Seeking Utopia: Communities and the Commons in the Contemporary Media Environment (Chp. 30). In *Information and Communication Technologies, Society and Human Being – Theory and Framework* (Haftor and Mirijamdotter). Information Science Reference.
- Park, H.W. and Thelwall, M. (2009). Developing Network Indicators for Ideological Landscapes from the Political Blogosphere in South Korea. *Journal of Computer-Mediated Communication*.
- Parikh, A., Behnke, C., Vorvoreanu, M., Almanza, B. and Nelson, D. (2013). Motives for reading and articulating user-generated restaurant reviews on Yelp.com. *Journal of Hospitality and Tourism Technology*, 5, 2, 160-176
- Patton, M. Q. (2002). *Qualitative Research and Evaluation Methods* (3rd ed.). Thousand Oaks, CA: Sage.
- Pengnate, S. and Sarathy, R. (2017). An experimental investigation of the influence of webiste emotional design featues on trust in unfamiliar online vendors. *Computer in Human Behavior*, 49-60.

- Pennanen, M. and Vakkari, P. (2002). Students' cognition and information searching while preparing a research proposal. In Bruce, H., Fidel, R., Ingwersen, P., and Vakkari, P. (Eds). *Emerging frameworks and methods. Proceedings of the Fourth International Conference on Conceptions of Library and Information Science (CoLIS4)*, 33-48. Seattle, WA: Libraries Unlimited.
- Petty, R. E., Rucker, D. D., Bizer G. Y., & Cacioppo, J. T. (2004). The elaboration likelihood model of persuasion. In J. S. Seiter & R. H. Gass (Eds.), *Perspectives on persuasion, social influence, and compliance gaining* (pp. 65–89). Boston, MA: Allyn & Bacon.
- Petty, R.E. and Cacioppo, J.T. (1986). The elaboration likelihood model of persuasion. *Advances in Experimental Social Psychology*, 19, 123-205.
- Pew Research Center (2009). *Generations Online in 2009*. Retrieved from <http://www.pewinternet.org/Reports/2009/Generations-Online-2009.aspx>
- Pharo, N. (2002). *The SST Method Schema: A Tool for Analysing Work, Task-based Web Information Search Processes*, University of Tampere, Tampere.
- Pirolli, P. (1997). Computational Models of Information-Scent following in a very large browsable text collect. In S. Pemberton (ed). *Proceedings of the Conference on Human Factors in Computing Systems (CHI'97)*, Atlanta, GA, 3-10. New York. ACM Press.
- Pirolli, P. (2003). Exploring and Finding Information. In Carroll, J. (ed)., *HCI Models, Theories and Frameworks: Toward a Multidisciplinary Science*, 157-191. San Francisco: Morgan Kauffmann.
- Pirolli, P. (2007). *Information Foraging Theory: Adaptive Interaction with Information*, New York, NY: Oxford University Press.
- Pirolli, P. (2009). *Information Foraging Theory: Adaptive Interaction with Information*. Oxford University Press. New York.
- Pirolli, P. and Card, S.K. (1995). Information foraging in information access environments. In *Proceedings of the CHI '95. ACM Conference on Human Factors in Software*, 51-58. New York: Association for Computing Machinery.
- Pirolli, P. and Card, S.K. (1997). *The Evolutionary Ecology of Information Foraging*,. Technical Representation, UIR-R97-01, Palo Alto, CA: Xerox PARC.
- Pirolli, P. and Card, S.K. (1999). Information Foraging. *Psychological Review*, 106, 643-675.
- Pirolli, P., Card, S.K., and Van Der Wege, M.M. (2001). Visual information foraging in a focus + context visualization. In *Proceedings of CHI-01, 19th Conference on Human Factors in Computing Systems* (Seattle, WA), 506-513. Doi: 10.1145/365024.365337

- Poole, A. and Ball, L.J. (2006). Eye tracking in human-computer interaction and usability research: Current status and future prospects. *Encyclopedia of Human Computer Interaction*.
- Popkin, S. L. (1993). Information Shortcuts and the Reasoning Voter. In Grofman, B. (ed.). *Information Participation and Choice: An Economic Theory of Democracy in Perspective*, 17-35. Ann Arbor, MI: University of Michigan Press.
- Pornsakulvanich, V., Haridakis, P. and Rubin, A.M. (2008). The influence of dispositions and Internet motivation on online communication satisfaction and relationship closeness. *Computers in Human Behavior*, 24(5), 2292-2310.
- Purves, D., Augustine, G.J., Fitzpatrick, D., Katz, LaMantia, A.S., McNamara J.O. and Williams, S.M. (eds) *Neuroscience. Types of Eye Movements and Their Functions* (2nd ed). Sunderland (MA) : Sinauer Associates. Retrieved from <http://www.ncbi.nlm.nih.gov/books/NBIC10991>.
- Qu, P., Liu, C and Lai, M (2010). The effect of task type and topic familiarity on information search behaviours. In *Proceedings of the 3rd Symposium on Information Interaction in Context*. New Brunswick, NJ. 18-21 August 2010, 371-374. New York. ACM.
- Raschke, M., Blascheck, T. and Burch, M. (2014). *Visual analysis of eye tracking data*. In Huang, W., *Handbook of Human Centric Visualization*. (ed). Springer Science.
- Rayner, K. (1998). Eye movements in reading and information processing: 20 years of research. *Psychological Bulletin*, 124: 372-422.
- Reader, W.R. and Paynet, S.J. (2007). Allocating time across multiple texts: sampling and satisficing. *Human-Computer Interaction*, 22(3), 263-298.
- Rieger, O.Y. (2009). Search engine use behaviour of students and faculty: user perceptions and implications for future research. *First Monday*, 14(12). Retrieved from <http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/2716/2385>
- Rieh, S.Y. (2002). Judgement of information quality and cognitive authority in the Web. *Journal of the American Society for Information Science and Technology*, 53(2): 145-161.
- Rieh, S.Y. and Danielson, D.R. (2007). Credibility: a multidisciplinary framework. In Cronin, B. (Ed.), *Annual Review of Information Science and Technology*, 41, 307-364. Medford, NJ: Information Today.
- Rieh, S.Y., Kim, Y.M., and Markey, K. (2012). Amount of invested mental effort (AIME) in online search. *Information Processing and Management*, 48, 1136-1150.
- Robins, D., and Holmes, J. (2008). Aesthetics and credibility in web site design. *Information Processing and Management*, 44, 386-399.

- Rogers, E.M. (1995). *Diffusion of Innovations*. New York. The Free Press.
- Roscoe, R.D., Grebitus, C., O'Brian, J., Johnson, A.C. and Kula, I. (2016). Online information search and decision making: Effects of web search stance. *Computers in Human Behavior*, 56, 103-118.
- Rose, D.E. and Levinson, D. (2004). Understanding user goals in web search. In Feldman, S.I., Uretsky, M., Najork, M., and Wills, C.E. (Eds). *Proceedings of the 13th Annual World Wide Web Conference*, ACM Press, New York, NY, 13-19.
- Ruben, B.D. (1992). The Communication-Information Relationship in a System-Theoretic Perspective. *Journal of the American Society for Information Science*, 43, 15-27.
- Russo, J.E. and Leclerc, F. (1994). An eye-fixation analysis of choice processes for consumer nondurables. *Journal of Consumer Research*. Vol. 21, 2, 274-90.
- Salvucci, D.D. and Goldberg, J.H. (2000). Identifying fixations and saccades in eye-tracking protocols. In *Proceedings of the Eye Tracking Research and Applications Symposium* (pp. 71-78). New York: ACM Press.
- Saldana, J. (2013). *The Coding Manual for Qualitative Researchers*, 2nd ed, Sage.
- Salomon, G. (1984). Television is “easy” and print is “tough”: The differential investment of mental effort in learning as a function of perceptions and attributions. *Journal of Educational Psychology*, 76(4), 647–658.
- Salomon, G. (1981). Introducing AIME: The assessment of children’s mental involvement with television. In K. Kelly & H. Gardner (Eds.), *New directions for child development: Viewing children through television* (pp. 89–102). San Francisco: Jossey-Bass.
- Sandstrom, P.E. (2001). Scholarly Communication As a Socioecological System. *Scientometrics*. 51(3). 573-605.
- Saracevic, T. (1996). Relevance reconsidered, In Ingwerson, P. and Pors, N.O. (Eds), *Second International Conference on Conceptions of Library and Information Science (CoLIS2): Integration in perspective*, 201-218. Copenhagen: Royal School of Librarianship.
- Saracevic, T. and Kantor, P. (1988). A study of information seeking and retrieving. II. Users, questions, and effectiveness. *Journal of the American Society for Information Science*, 39(3), 177-196.
- Sauro, J. and Dumas, J. (2009). Comparison of three one-question, post-task usability questionnaires. In *Proceedings of Conference in Human Factors in Computing Systems (CHI 2009)*. Boston, MA.
- Savolainen, R. (2007). Filtering and Withdrawing: Strategies for Coping with Information Overload in Everyday Contexts. *Journal of Information Science*, 33, 5, 611-621.

- Savolainen, R. (2012a). Elaborating the Motivational Attributes of Information Need and Uncertainty. *Information Research*. Vol. 17, No. 2.
- Savolainen, R. (2012b). Expectancy-value beliefs and information needs as motivators for task-based information seeking. *Journal of Documentation*, 68, 4, 490-511.
- Savolainen, R., and Kari, J. (2004). Conceptions of the internet in everyday life information. *Journal of Information Science*, 30,3, 219-226.
- Schmidt, J. (2007). Blogging Practices: An Analytical Framework. *Journal of Computer-Mediated Communication*. Vol. 12, Issue 4.
- Schamber, L., Eisenber, M. and Nilan, S.M. (1990). A re-examination of relevance: toward a dynamic, situational definition. *Information Processing and Management*, 26(6), 755-776.
- Self, C.S. (1996). Credibility. In Salwen, M. & Stacks, D. (eds). *An Integrated Approach to Communication Theory and Research*. Mahwah, NJ: Erlbaum.
- Seong, W. and Chae K.C.L. (2013). Exploring the effect of human brand on consumers' decision quality in online shopping. *Online Information Review*. Vol. 37, 1, 83-100.
- Shatford-Layne, S. (1994). Some issues in the indexing of images. *Journal of the American Society for Information Science*, 45(8), 583-588.
- Sharit, J., Hernandez, M.A., Czaja, S.J. and Pirolli, P.L. (2008). Investigating the role of knowledge and cognitive abilities in older adults information seeking on the Web. *ACM Transactions on Computer-Human Interaction*, 15(1), 1-25.
- Shiri, A. (2005). Topic familiarity and its effects on term selection and browsing in a thesaurus-enhanced search environment. *Library Review*, 54(9), 514-518.
- Shiri, A. and Revie, C.W. (2003). The effects of topic complexity and familiarity on cognitive and physical moves in a thesaurus-enhanced search environment. *Journal of Information Science*, 29, 517-526
- Shon, J. and Musen, M.A. (1999). The low availability of metadata elements for evaluating the quality of medical information on the World Wide Web, In *Proceedings of AMIA Symposium*, (pp. 945-949).
- Sihvonen, A. and Vakkari, P. (2004). Subject knowledge improves interactive query expansion assisted by a thesaurus. *Journal of Documentation*, 60(6), 673-690.
- Simon, H.A. (1971). Designing organizations for an information-rich world. In Greenberger M. *Computers, Communication, and the Public Interest*. Baltimore, M.D. The John Hopkins Press, 40-41.
- Simon, H.A. (1997). *Administrative Behavior: A Study of Decision-Making Processes in Administrative Organizations*. Free Press. New York.

- Singer, G., Norbistrath, U. and Lewandowski, D. (2013). Ordinary search engine users carrying out complex search tasks. *Journal of Information Science*, 39, 3, 346-358.
- Sobel Test (2018). Retrieved from <https://www.easycalculation.com/other/sobel-test.php>
- Solomon, M.R., Zaichkowsky, J.L and Polegato, R. (1996). *Consumer Behaviour: Buying, Having and Being*. Scarborough, ON: Prentice-Hall Canada, Inc.
- Spink, A. and Cole, C. (2004). A human information behaviour approach to the philosophy of information. *Library Trends*, 52(3), 373-380.
- Spink, A. and Cole, C. (2006). Human Information Behavior: Integrating diverse approaches and information use. *Journal of the American Society for Information Science and Technology*, 57, 1, 25-35.
- Stangor, C. (2010). *Research Methods for the Behavioural Sciences*: Wadsworth Pub Co.
- Stephens, D.W. and Krebs, J.R. (1986). *Foraging Theory*. Princeton, NJ: Princeton University Press.
- Stotland, E. and Canon, L.K. (1972). *Social Psychology: A Cognitive Approach*. Philadelphia,
- Sundar, S.S. (1999). Exploring receivers' criteria for perception of print and online news. *Journalism & Mass Communication Quarterly*, 76(2), 373-386.
- Sundin, O. and Johannisson, J. (2005). The Instrumentality of Information Needs and Relevance. In Crestani, I. F. and Ruthven, I. (eds). *Information Context: Nature, Impact and Role*. 5th International Conference on Conceptions of Library and Information Sciences.
- Sundar, S.S., Knobloch-Westerwick, S. and Hastall, M.R. (2007). *News Cues: Information Scent and Cognitive Heuristics*. Wiley Periodicals, Inc
- Sutcliffe, A.G., Ennis, M. and Watkinson, S.J. (2000). Empirical studies of end-user information searching. *Journal of the American Society for Information Science*, 51, 13, 1211-1231.
- Suter, W.N. (2012). *Introduction to Educational Research: A Critical Thinking Approach*, 2nd ed. Sage.
- Suter, W. N. (2013). *Introduction to Educational Research – A Critical Thinking Approach* (2nd ed.). Sage Publications.
- Teddie, C., Tashakkori, A. and Johnson, B. (2008). Emergent technologies in gathering and analysis of mixed methods data. In Hesse-Biber, H. and Leavy, P. (Eds). *Handbook of Emergent Methods*, 389-413. New York, NY: Guilford Press.
- Tesser, D. (2002). Information foraging theory. In *The Glossary of Human Computer Interaction*. Interaction Design Foundation. Retrieved from <https://www.interaction-design.org/literature/book/the-glossary-of-human-computer-interaction>

- Thatcher, A. (2006). Information-seeking Behaviours and Cognitive Search Strategies in Different Search Tasks on the WWW. *International Journal of Industrial Ergonomics*, 36, 1055-1068.
- Thatcher, A. (2008). Web Search Strategies: The Influence of Web Experience and Task Type. *Information Processing & Management*. 44(3), 1308-1329.
- Thatcher, A. and Greyling, M. (1998). Mental models of the internet. *International Journal of Industrial Ergonomics*, 22 (4-5), 299-305.
- Thielsch, M.T. and Hirschfeld, G. (2012). Spatial frequencies in aesthetic website evaluations – explaining how ultra-rapid evaluations are formed. *Ergonomics*, 55, 7, 731-742.
- Tobii (2013). *Qualitative Web Usability Testing*. *Eye Tracking Research Global*. Retrieved from <http://www.tobii.com/eye-tracking-research/global/library/videos/all/qualitative-web-usability-testing/> on 20 December 2013.
- Todd, S. and Kramer, A.F. (1993). Attentional guidance in visual attention. In *Proceedings of the Human Factors and Ergonomics Society, 37th Annual Meeting*, 1378-1382. Santa Monica, CA.
- Tombros, A., Ruthven, I. and Jose, J.M. (2005). How Users Assess Web Pages for Information Seeking. *Journal of the American Society for Information Science and Technology*, 56, 327-344.
- Tomasi, S.D. (2014). Using cues to forage for information on the Web. *Journal of Systems and Information Technology*, 16(4), 296-312.
- Toms, E.G., Villa.R. and McCay-Peet, L. (2013). How is a search system used in work task completion? *Journal of Information Science*, 39(1), 15-25.
- Tractinsky, N., Katz, A.S. and Ikar, D. (2000). What is beautiful is usable. *Interacting with Computers*, 13, 137-145.
- Ulyshen, T.Z., Koehler, M.J. and Gao, F. (2015). Understanding the connection between epistemic beliefs and Internet searching. *Journal of Educational Computing Research*, 53, 3, 345-383.
- Vakkari, P. (1999). Task complexity, problem structure and information actions: Integrating studies on information seeking and retrieval. *Information Processing and Management*, 35, 6, 819-837.
- Vakkari, P. (2000). Elevance and contributory information types of searched documents in task performance, in Belkin, N.J., Ingwersen, P. and Leong, M.K. (Eds). *Proceedings of the 23rd Annual International ACM SIGIR, Conference on Research and Development in Information Retrieval*, ACM Press, New York, NY, pp. 2-9

- Vakkari, P. (2002). Subject knowledge, source of terms, and term selection in query expansion: an analytical study. *Advances in Information Retrieval, Proceedings of 24th BCS-IRSG, European Colloquium on IR Research*, Lecture Notes in Computer Science, 2291, 110-123.
- Vakkari, P. (2003). Task-based information searching, In Cronin, B. (Ed). *Annual Review of Information Science and Technology*, 37, 413-464.
- Vakkari, P. (2005). Task-based information searching. *Annual Review of Information Science and Technology*, 37(1).
- Vakkari, P. and Hakala, N. (2000). Changes in relevance criteria and problem stages in task performance. *Journal of Documentation*, 56, 5, 540-62.
- Vaughan, L. and Thelwall, M. (2003). Scholarly use of the web: What are the key inducers of links to journal web sites. *Journal of the American Society for Information Science and Technology*, 54, 1, 29-38.
- Vance, A., Elie-Dit-Cosaque, C., & Straub, D. W. (2008). Examining trust in information technology artifacts: the effects of system quality and culture. *Journal of Management Information Systems*, 24(4), 73e100.
- Velayathan, G. and Yamada (2007), S. *Behavior-based Web page Evaluation*. In WWW, 2007, Banff, Alberta, Canada.
- Wathen, C.N. and Burkell, J. (2002). Believe it or not: factors influencing credibility on the web. *Journal of the American Society for Information Science and Technology*, 53(2): 134-144.
- Watson, C. (2014). An exploratory study of secondary students' judgements of the relevance and reliability of information. *Journal of the Association for Information Science and Technology*, 65(7), 1385-1408.
- Weber, R.P. (1990). *Basic content analysis*. (2nd ed). Newbury Park, CA: Sage Publications.
- Webster, J. (2011). Structuring a Marketplace of Attention, In Turow, J. and Tsui, L. (ed.), *The Hyperlinked Society: Questioning Connection in the Digital Age*. The University of Michigan Press. USA.
- Weng, L., Ratkiewicz, J., Perra, N., Goncalves, B., Castilio, C., Bonchi, F., Schifanella, R., Meczer, F. And Flammini, A. (2013). *The Role of Information Diffusion in the Evolution of Social Networks*. KDD'13, ACM, Chicago, Illinois, U.S.A.
- Westerwick, A. (2013). Effects of sponsorship, web site design, and Google ranking on the credibility of online information. *Journal of Computer-Mediated Communication*, 18(2), 80-97.
- Wildermuth, B.M. (2004). The effects of domain knowledge on search tactic formulation. *Journal of the American Society for Information Science*, 55(3), 246-258.

- Wildemuth, B., Freund, L. and Toms, E.G. (2014). Untangling search task complexity and difficulty in the context of interactive information retrieval studies. *Journal of Documentation*, 70, 6, 1118-1140.
- Wiley, J., Goldman, S. R., Graesser, A. C., Sanchez, C. A., Ash, I. K., & Hemmerich, J. A. (2009). Source evaluation, comprehension, and learning in Internet science inquiry tasks. *American Educational Research Journal*, 46, 1060-1106.
- Wimmer, R.D. and Dominick, J.R. (2014). *Mass Media Research – An Introduction* (10e). Wadsworth, Cengage Learning.
- Wilson, P. (1973). Situational relevance. *Information Storage and Retrieval*, 9, 457-469.
- Wilson, P. (1983). *Second-hand Knowledge: An Inquiry Into Cognitive Authority*. Westport, CT: Greenwood Press.
- Wilson, T.D. (1997). Information Behaviour: An Interdisciplinary Perspective. *Information Processing & Management*. Vol. 33. No. 4. pp. 551-572.
- Wilson, T.D. (1999). Models in Information Behavior Research. *Journal of Documentation*, 55 (3), 249-270.
- Wilson, T.D. (2000). Human Information Behaviour. Special Issue on Information Science Research. *Informing Science*. Vol. 3, No. 2.
- Winter, S. and Kramer, N.C. (2012). Selecting science information in Web 2.0: how source cues, message sidedness, and need for cognition influence users' exposure to blog posts. *Journal of Computer-mediated Communication*, 18, 80-96.
- Wise, K., Bolls, P. and Schaefer, S. (2008). Choosing and reading online news : How available choice affects cognitive processing. *Journal of Broadcasting & Electronic Media*, 52(1), 69-85
- Wittek, P., Liu, Y-H., Daranyi, S., Gedeon, T. and Lim, I.S. (2016). Risk and ambiguity in information seeking: Eye gaze patterns reveal contextual behaviour in dealing with uncertainty. *Frontier in Psychology*, 7, 1790
- Wood, R.E., Mento, A.J. and Locke, E.A. (1987). Task complexity as a moderator of goal effects: A meta-analysis. *Journal of Applied Psychology*, 72(3), 416-425.
- Xie, I. (2008). Dimensions of tasks: Influences on information-seeking and retrieving process. *Journal of Documentation*, 65, 3, 339-366.
- Xie.I. and Joo, S. (2012). Factors affecting the selection of search tactics: tasks, knowledge, process and systems. *Information Processing and Management*, 48, 254-270.
- Yellowlees, P.M. and Brooks, P.M. (1999). Health on line: the future isn't what it used to be. *Medical Journal of Australia*, 171, 522-525.

- Yi, K. and Jin, T (2008). Hyperlink analysis of the visibility of Canadian Library and Information Science of school web sites. *Online Information Review*, 32, 3, 325-347.
- Young, R.M. (1983). Surrogates and mappings: two kinds of conceptual models for interactive devices. In Gentner, D., & Stevens, A.L. (eds), *Mental Models*, 35-52.
- Zhang, Y. (2008). The influence of mental models on undergraduate students' searching behaviour on the Web. *Information Processing and Management*, 44(3), 1330-1334.
- Zhang, Y. (2012). The impact of task complexity on people's mental models of MedlinePlus. *Information Processing and Management*, 48, 107-119.
- Zulman, D.M., Kirch, M., Zheng, K. and An, L.C. (2011). Trust in the internet as a health resource among older adults: Analysis of data from a nationally representative survey. *Journal of Medical Internet Research*, 13(1), 1-10.

APPENDIX A: Informed Consent

Nanyang Technological University

Division of Information Studies
31 Nanyang Link, WKWSCI Building
Singapore 637718

Informed Consent

Please read this consent agreement carefully. You must be 18 years old or older to participate.

Purpose of the research:

The purpose of this research is to study online information seeking behavior. This research is being conducted under the supervision of Dr Natalie Pang, Asst Professor of Information Studies at the Nanyang Technological University.

What you will do in this study:

For eye-tracking field observation

You will complete two tasks, that will take about **45 minutes**.

For face to face interview

For face to face interview and brief surveys, you will answer a set of questions, that will take about **20 minutes**. Tape recording will be used for the purpose of verbatim transcript.

Honararium/Course credit

Participants have the options to choose to receive either an honorarium or the course credit.

For your participation, you will receive an **honorarium** of \$15 per hour. The total honorarium shall be \$15.25 for 65 minutes for completion of two tasks, questionnaire surveys and interview. In the event that the research participation exceeds 65 minutes, the honorarium will be pro-rated based on \$15 per hour. Should you wish to withdraw from this research, and have started on one task, you will be paid a pro-rated honorarium of \$7.00 flat rate, regardless of the completion of tasks. If you have participated in the experiment for an hour and decided to withdraw from the exercise, you will be paid the full honorarium of \$15, regardless of the completion of tasks.

For the option of **course credit** – one(1) course credit will be offered to either the Fundamental in Research, or the Media Law course as part of the research assessment component, for your participation in this study.

Risks:

There are no anticipated risks, beyond those encountered in daily life, associated with participating in this study.

Voluntary Withdrawal:

Your participation in this study is completely voluntary, and you may withdraw from the study at any time without penalty. However, it is important to us that you answer as many questions as possible. You may skip over any questions or procedures, or you may withdraw by informing the research associate that you no longer wish to participate (no question will be asked). Your decision to participate, decline, or withdraw participation will have no effect on your status or relationship with the Nanyang Technological University.

Confidentiality:

Your participation in this study will remain confidential, and your identity will not be stored with your data. Your responses will be assigned a code number that is not link to your name or other identifying

information. Tape recording and photograph taking may be used for the purpose of transcription, and visual record. To protect your privacy, your face will not be captured in the photograph. All data and consent forms will be stored in a locked room. Results of this study may be presented at conferences and/or published in books, journals, and/or in the popular media.

Further Information:

If you have questions about the study or your rights as a participant in this study, please contact Dr. Natalie Pang, Division of Information Studies, School of Communication and Information, Nanyang Technological University. Email: nlspang@ntu.edu.sg. Telephone : 67904881

Who to contact about your rights in this study:

If you have any concerns about this study or your experience as a participant, you may contact Dr. Natalie Pang at 65-67904881; email: nlspang@ntu.edu.sg

Agreement:

The purpose and nature of this research have been sufficiently explained and I agree to participate in this study. I understand that I am free to withdraw at any time without incurring any penalty. I understand that I will receive a copy of this form to take with me.

Signature:_____ Date:_____

Name(print):_____

APPENDIX B : Task Instructions (Non-specific)

TASK INSTRUCTIONS

Non-specifically defined task instructions

Task 1(a): Food information search

Your company is hosting a dinner for ten colleagues from the U.S Headquarter office. Your boss has requested you to search for information on the websites on popular restaurants or cuisines in Singapore. You would also read the reviews and recommendations posted by the food bloggers.

You plan to navigate the internet to explore several relevant websites and bloggers' pages for the information search.

Instructions:

- Start the search query as you would in your real life information search online;
- Additionally, explore the following website link

*<http://www.....blogspot.sg> **

**name of website removed for privacy purpose*

Task 1(b) - Travel information search

You are planning to travel and work in South Africa next year. You would like to search several websites for information relating to the places of interest, culture and lifestyle, and bloggers' travel stories/information in Africa.

You plan to navigate the internet to explore several relevant websites and bloggers' pages for the information search.

Instructions:

- Start the search query as you would in your real life information search online;
- Additionally, explore the following website link

<http://www.lonelyplanet.com/africa>

Task Instructions (Specific)

Specifically-defined task instructions

2 (a) Instruction

You are planning to travel and work in South Africa next year. You would like to search several websites for information relating to the places of interest, people and culture, and bloggers' travel stories in South Africa.

Plan your information search and start navigating the internet for the following information:

- ☐ 3 places of interest in South Africa
- ☐ Culture and lifestyle in Africa
- ☐ Two bloggers' travel stories/information on Africa travel

Instructions:

- Start the search query as you would in your real life information search online;
- Additionally, explore the following website link

<http://www.lonelyplanet.com/africa>

Task 2(b) instruction :

Your company is hosting a dinner for ten colleagues from the U.S Headquarter office . Your boss has requested you to search for information on the website for restaurants that serve popular Singapore seafood and vegetarian cuisines. You would also read the reviews and recommendations posted by the food bloggers.

Start the information search and navigate to the relevant websites. Provide the suggestions to your boss, details should include:

- ☐ two **food blogger's** recommendation (seafood and vegetarian cuisines)
- ☐ one **seafood** restaurant in each zone
 - East zone
 - West zone
- ☐ one **vegetarian** restaurant in each zone
 - East zone
 - West zone

Instructions:

- Start the search query as you would in your real life information search online;
- Additionally, explore the following website link

<http://www.....blogspot.sg> *

**name of website removed for privacy purpose*

APPENDIX C : Survey Questionnaire

SURVEY QUESTIONNAIRE

S/No. _____

Name : _____ (optional)

Date : _____

Nationality : _____

Gender : Male () Female ()

A. Personal Particulars

(Please tick on appropriate information that applies to you.)

1. What is your age?

☐ 18-24 ☐ 25-30 ☐ 31-39 ☐ 40 - 49 ☐ 50 & above

2. What is your highest educational qualification, and your current education, if any?

☐ Polytechnic ☐ College ☐ Degree
☐ Masters ☐ PhD ☐ Others : _____

Current educational level (if any) : _____ at year _____

B. Internet Use

3. Which of the social networking sites do you have an account in?

Blogs Facebook Twitter Instagram Others:
☐ ☐ ☐ ☐ ☐

(Tick whichever that applies)

(please indicate)

	(1) Least Frequently	(2)	(3)	(4)	(5) Most Frequently
4. I browse the Internet using search engine(s) for general information search.	☐	☐	☐	☐	☐
5. I use direct URL address (website address) for information search.	☐	☐	☐	☐	☐
6. I use the following social media sites to look for information.					
a) Facebook	☐	☐	☐	☐	☐
b) Blogs	☐	☐	☐	☐	☐
c) Forum	☐	☐	☐	☐	☐
d) Twitter	☐	☐	☐	☐	☐
e) Others : _____	☐	☐	☐	☐	☐
7. I post comments on social media sites					
a) Facebook	☐	☐	☐	☐	☐
b) Blogs	☐	☐	☐	☐	☐
c) Forum	☐	☐	☐	☐	☐
d) YouTube'	☐	☐	☐	☐	☐
e) Others : _____	☐	☐	☐	☐	☐

8. I bookmark information on webpage to facilitate my information search.
(e.g. save the webpage to your Favourite bar for future reference)	☐	☐	☐	☐	☐
9. I share information with family members, friends and online users by using links (e.g. providing a text link, image or video links to a website)	☐	☐	☐	☐	☐

C. Perception of Using Web Links and Cues

Please tick either Yes or No.

10. When conducting information search on the Internet, I usually click on text links, images, or URL links for recommendations to navigate to other source of information.	() Yes	() No
11. When conducting information search on the Internet, I usually click on advertisement banners for recommendations to navigate to other source of information.	() Yes	() No
12. When navigating the Internet for information, I usually find unexpected information through text-links, images or URL displayed within the webpage.	() Yes	() No
13. The categories and headings displayed within the webpage that link me to other sources are useful for my information search.	() Yes	() No
14. Images, tags, videos displayed within the webpage that link me to other sources are useful for my information search.	() Yes	() No
15. Comments and recommendations of other online users are useful for my information search.	() Yes	() No
16. Digital tools such as 'like' and 'dislike' clicks by other online users have an influence on my perception about the information or product/services.	() Yes	() No
17. To share information with others, I usually forward images, text-link or URL address through email .	() Yes	() No
18. To share information with others, I usually attach page links, images, URL links or text-link on my social media site (s) (such as blogs, Facebook)	() Yes	() No
19. To share information with others, I usually attach page links, images, URL links or text-link on their social media site (s) (such as blogs, Facebook)	() Yes	() No

D. Use of Weblinks

If you have ticked at least a 'Yes' on using links from Q10 – 19, **proceed to answer Q20.**

20. Reasons for using web links, such as images, text links, tags

(Please rank from 1 to 8 : 1 being most likely, and 8 being least likely)

- () It provides me with more relevant information.
- () I may find new information from the web links (through images, video, text-link and the like).
- () It helps me complete my information search or task in a shorter time
- () I am just curious to see what I can find from the web links or text link.
- () It helps in collaborating with others in information sharing
- () I am attracted by the images and/or text links
- () I trust the source or blogger for his/her recommendation of products, service and other information.
- () It connects me with other people of similar interest.

If you have ticked 'No' on using links from Q10-19, **proceed to answer Q21.**

21. Reasons for NOT using web links *(please tick whichever applies)*.

(Please rank from 1 to 8 : 1 being most likely, and 8 being least likely)

- () I am not interested to read other information.
- () I prefer to seek colleagues or friends' advice, and go direct to the information source.
- () It is not relevant to my information search.
- () I do not trust the source or blogger's recommendation of products, services and other information.
- () It prolongs my time to look beyond the webpage..
- () It leads to information overload.
- () I don't know what to do with the abundance of information.
- () It does not serve my purpose of information search.

E. Quality and value of webpage and information

	(1) Totally Agree	(2) Agree	(3) Neutral	(4) Disagree	(5) Totally Disagree
22. I trust the quality * of information from the webpage based on the following:					
(* <i>quality refers to the accuracy, credibility and authority of the information on the website in relation to other sources, to help you complete the task.</i>)					
a. my colleagues' recommendations to the website.	☐	☐	☐	☐	☐
b. the knowledge expertise of the author of the webpage	☐	☐	☐	☐	☐
c. the amount of the links from other webpages	☐	☐	☐	☐	☐
d. the information richness on the webpage	☐	☐	☐	☐	☐
e. the number of pictures and images on the webpage	☐	☐	☐	☐	☐
f. the numbers of followers, 'likes' indication	☐	☐	☐	☐	☐
g. the number of advertisement banners	☐	☐	☐	☐	☐
h. the number of comment responses	☐	☐	☐	☐	☐
23. I trust the value * of information from the Webpage based on the following:					
(* <i>value refers to the trustworthiness and currency (updated) information in relation to sources, and the level of satisfaction, that help you meet your information task.</i>)					
a. my colleagues' recommendations to the website.	☐	☐	☐	☐	☐
b. the knowledge expertise of the author of the webpage	☐	☐	☐	☐	☐
c. the amount of the links from other webpages	☐	☐	☐	☐	☐
d. the information richness on the webpage	☐	☐	☐	☐	☐
e. the number of pictures and images on the webpage	☐	☐	☐	☐	☐
f. the numbers of followers, 'likes' indication	☐	☐	☐	☐	☐
g. the number of advertisement banners	☐	☐	☐	☐	☐
h. the number of comment responses	☐	☐	☐	☐	☐

~ Thank you for your participation ~

APPENDIX D : Interview Questions

SEMI-STRUCTURED INTERVIEW QUESTIONS

(A) *Internet Use*

1. Which internet browser do you normally use? (Internet Explorer, Google Chrome, Firefox etc.). Why?

(B) *Task*

2. How would you rate the level of difficulty in these information tasks? (*LP and food blog websites*). Rate 1 -7, least difficult to most difficult
3. Explain why is it least or most difficult to you?
4. Have you searched for this topic before?
Yes - what type of decision did you make to start the information search?
No - what type of decision did you make to help you start the unfamiliar search topic?
5. After reading the task instructions, what were some key thoughts (intentions) to fulfil the information task goal? (e.g. thinking of keyword search, an organisation, timeline to complete the task etc.)

(C) *Information search*

6. What are the criteria you look for when selecting certain websites for your information search?
7. What are the tools that help you navigate from one webpage to another webpage?
8. From the web-links (image, video, text links and other web links) that you have used, why did you decide to click on it?
9. Why did you not click on the other web-links (image, video, text links and other web links)?
10. When would you decide to leave a webpage to move to another webpage?
(i.e. the reason that you have decided to leave a webpage)
11. Have you wanted to give up information search at any point? Yes/No. Why?
12. Why did you not complete the task? (*optional, depend on task completion*)
13. Why did you select these bloggers' or others' recommendations?

14. Are you satisfied with the information search outcome relevant to the task?

Yes/No. Which aspect of the information search that you are satisfied?

15. Do you believe in the information retrieved from the source for these tasks?

Yes/No. What makes you think so? Why not?

(D) Credibility evaluation

16. Rate the credibility, 1-7 (least to best), based on quality and value of the information.

(for LP and food blog websites)

17. Explain how would you judge the quality (e.g. content) of the information.

18. Explain how would you judge the value (e.g. current, trustworthiness) of the information.

19. Explain how would you judge the relevance (meet task needs) of the information.

APPENDIX E: Coding instructions

Coding Guidelines

Instructions

1. The unit of analysis are the respondents' comments on the travel (*LonelyPlanet*) and the food blogger's websites.
2. Please code according the value assigned below.

Part I

The coding values 0 or 1 is to be coded for negative and positive comments on informational cues of the websites. Informational cues refer to the visual elements or users' information perception on the websites and source.

Code	Description
0	Negative feedback (weak informational cues)
1	Positive feedback (strong informational cues)

Examples of negative comments (*weak informational cues*) where 0 is assigned:

- *the font is hard to read*
- *the interface is messy*
- *I have not heard of the website – not trusting*
- *It's one-sided opinion, not objective*

Examples of positive comments (*strong informational cues*) where 1 is assigned:

- *the website is popularly known*
- *there are reviewers*
- *there are many images, I prefer pictures*
- *I have searched the site before*

Coding Guidelines

The same codes 0 for 'No' and 1 for 'Yes' apply to the rest of the categories identified in the interviewees' feedback. Please key in the codes on the excel spreadsheet and allocate the number relevant to the following descriptions. For responses that are not within the categories, place it in 'Others' and suggest a theme, to be discussed with the researcher.

Descriptions	Code
Web layout	
(1) Aesthetic (e.g.font, colour and size)	0/1
(2) Reading ease	0/1
(3) Hyperlinks	0/1
(4) Language/writings	0/1
(5) Appropriateness	0/1
(6) Advertisement	0/1
(7) Trustworthiness	0/1
(8) Reviews	0/1
Source	
(9) familiarity	0/1
(10) expertise	0/1
(11) popularity or reputation	0/1
(12) credibility	0/1
Attention	
(13) longer fixations	0/1
(14) exit	0/1
Others	
please specify :	
(15) _____	0/1
(16) _____	0/1

Appendix F : Repeated Measures_Clicks_Food

General Linear Model

Within-Subjects Factors	
Measure: MEASURE_1	
	Dependent
Clicks_Food	Variable
1	Readmore_Food
2	Image_Food
3	Text_Food
4	Olderpost_Food
5	Header_Food
6	Categories_Food
7	Adclick_Food

Between-Subjects Factors			
		Value Label	N
Task types	1	Non-specific	80
	2	Specific	80

Descriptive Statistics				
	Task types	Mean	Std. Deviation	N
Readmore clicks_Food	Non-specific	.59	.852	80
	Specific	.25	.516	80
	Total	.42	.722	160
Image clicks_Food	Non-specific	.00	.000	80
	Specific	.24	.621	80
	Total	.12	.454	160
Textclicks_Food	Non-specific	.00	.000	80
	Specific	.00	.000	80
	Total	.00	.000	160
Oldernews clicks_Food	Non-specific	.28	.656	80
	Specific	.24	.621	80
	Total	.26	.637	160
Headers clicks_Food	Non-specific	.94	1.306	80
	Specific	.35	.638	80
	Total	.64	1.066	160
Categories clicks_Food	Non-specific	.78	1.292	80
	Specific	.50	.842	80
	Total	.64	1.096	160

Advertclicks_Food	Non-specific	.01	.112	80
	Specific	.00	.000	80
	Total	.01	.079	160

Multivariate Tests ^a					
Effect		Value	F	Hypothesis df	Error df
Clicks_Food	Pillai's Trace	.536	29.399 ^b	6.000	153.000
	Wilks' Lambda	.464	29.399 ^b	6.000	153.000
	Hotelling's Trace	1.153	29.399 ^b	6.000	153.000
	Roy's Largest Root	1.153	29.399 ^b	6.000	153.000
Clicks_Food * Task	Pillai's Trace	.235	7.836 ^b	6.000	153.000
	Wilks' Lambda	.765	7.836 ^b	6.000	153.000
	Hotelling's Trace	.307	7.836 ^b	6.000	153.000
	Roy's Largest Root	.307	7.836 ^b	6.000	153.000

Multivariate Tests ^a			
Effect		Sig.	Partial Eta Squared
Clicks_Food	Pillai's Trace	.000	.536
	Wilks' Lambda	.000	.536
	Hotelling's Trace	.000	.536
	Roy's Largest Root	.000	.536
Clicks_Food * Task	Pillai's Trace	.000	.235
	Wilks' Lambda	.000	.235
	Hotelling's Trace	.000	.235
	Roy's Largest Root	.000	.235

a. Design: Intercept + Task

Within Subjects Design: Clicks_Food

b. Exact statistic

Mauchly's Test of Sphericity ^a					
Measure: MEASURE_1					
Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon ^b Greenhouse-Geisser
Clicks_Food	.002	966.662	20	.000	.521

Mauchly's Test of Sphericity ^a			
Measure: MEASURE_1			
Within Subjects Effect	Huynh-Feldt	Epsilon	Lower-bound
Clicks_Food	.536		.167

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.^a

a. Design: Intercept + Task

Within Subjects Design: Clicks_Food

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects					
Measure: MEASURE_1					
Source		Type III Sum of Squares	df	Mean Square	F
Clicks_Food	Sphericity Assumed	73.148	6	12.191	26.727
	Greenhouse-Geisser	73.148	3.128	23.384	26.727
	Huynh-Feldt	73.148	3.219	22.726	26.727
	Lower-bound	73.148	1.000	73.148	26.727
Clicks_Food * Task	Sphericity Assumed	17.848	6	2.975	6.521
	Greenhouse-Geisser	17.848	3.128	5.706	6.521
	Huynh-Feldt	17.848	3.219	5.545	6.521
	Lower-bound	17.848	1.000	17.848	6.521
Error(Clicks_Food)	Sphericity Assumed	432.432	948	.456	
	Greenhouse-Geisser	432.432	494.240	.875	
	Huynh-Feldt	432.432	508.565	.850	
	Lower-bound	432.432	158.000	2.737	

Tests of Within-Subjects Effects		
Measure: MEASURE_1		
Source	Sig.	Partial Eta Squared
Clicks_Food	Sphericity Assumed	.000
	Greenhouse-Geisser	.000
	Huynh-Feldt	.000
	Lower-bound	.000
Clicks_Food * Task	Sphericity Assumed	.000
	Greenhouse-Geisser	.000
	Huynh-Feldt	.000
	Lower-bound	.012
Error(Clicks_Food)	Sphericity Assumed	
	Greenhouse-Geisser	
	Huynh-Feldt	
	Lower-bound	

Tests of Within-Subjects Contrasts					
Measure: MEASURE_1					
Source	Clicks_Food	Type III Sum of Squares	df	Mean Square	F
Clicks_Food	Linear	1.125	1	1.125	3.365
	Quadratic	1.316	1	1.316	3.238
	Cubic	66.150	1	66.150	138.166
	Order 4	3.508	1	3.508	7.664
	Order 5	1.019	1	1.019	1.594
	Order 6	.030	1	.030	.072
Clicks_Food * Task	Linear	.581	1	.581	1.736
	Quadratic	.013	1	.013	.031
	Cubic	13.537	1	13.537	28.276
	Order 4	.665	1	.665	1.453
	Order 5	.151	1	.151	.236
	Order 6	2.902	1	2.902	6.901
Error(Clicks_Food)	Linear	52.830	158	.334	
	Quadratic	64.231	158	.407	
	Cubic	75.646	158	.479	
	Order 4	72.321	158	.458	
	Order 5	100.962	158	.639	
	Order 6	66.443	158	.421	

Tests of Within-Subjects Contrasts			
Measure: MEASURE_1			
Source	Clicks_Food	Sig.	Partial Eta Squared
Clicks_Food	Linear	.068	.021
	Quadratic	.074	.020
	Cubic	.000	.467
	Order 4	.006	.046
	Order 5	.209	.010
	Order 6	.789	.000
Clicks_Food * Task	Linear	.190	.011
	Quadratic	.861	.000
	Cubic	.000	.152
	Order 4	.230	.009
	Order 5	.628	.001
	Order 6	.009	.042
Error(Clicks_Food)	Linear		
	Quadratic		
	Cubic		

Order 4	
Order 5	
Order 6	

Tests of Between-Subjects Effects						
Measure: MEASURE_1						
Transformed Variable: Average						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	99.008	1	99.008	161.762	.000	.506
Task	5.858	1	5.858	9.571	.002	.057
Error	96.705	158	.612			

Estimated Marginal Means

1. Task types

Estimates				
Measure: MEASURE_1				
Task types	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Non-specific	.370	.033	.304	.435
Specific	.225	.033	.160	.290

Pairwise Comparisons					
Measure: MEASURE_1					
		Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b
(I) Task types	(J) Task types				Lower Bound
Non-specific	Specific	.145 [*]	.047	.002	.052
Specific	Non-specific	-.145 [*]	.047	.002	-.237

Pairwise Comparisons		
Measure: MEASURE_1		
(I) Task types	(J) Task types	95% Confidence Interval for Difference
		Upper Bound
Non-specific	Specific	.237
Specific	Non-specific	-.052

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests					
Measure: MEASURE_1					
	Sum of Squares	df	Mean Square	F	Sig.
Partial Eta Squared					
Contrast	.837	1	.837	9.571	.002
Error	13.815	158	.087		

The F tests the effect of Task types. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

2. Clicks_Food

Estimates				
Measure: MEASURE_1				
Clicks_Food	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	.419	.056	.309	.529
2	.119	.035	.050	.187
3	.000	.000	.000	.000
4	.256	.050	.157	.356
5	.644	.081	.483	.804
6	.638	.086	.467	.808
7	.006	.006	-.006	.019

Pairwise Comparisons						
Measure: MEASURE_1						
(I) Clicks_Food	(J) Clicks_Food	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
1	2	.300*	.065	.000	.098	.502
	3	.419*	.056	.000	.247	.591
	4	.162	.071	.500	-.057	.382
	5	-.225	.106	.751	-.553	.103
	6	-.219	.091	.353	-.498	.061
	7	.413*	.056	.000	.240	.585
2	1	-.300*	.065	.000	-.502	-.098
	3	.119*	.035	.017	.012	.226
	4	-.138*	.037	.005	-.251	-.024

3	5	-.525*	.085	.000	-.789	-.261
	6	-.519*	.092	.000	-.802	-.235
	7	.113*	.035	.036	.004	.221
	1	-.419*	.056	.000	-.591	-.247
	2	-.119*	.035	.017	-.226	-.012
	4	-.256*	.050	.000	-.412	-.100
	5	-.644*	.081	.000	-.895	-.393
4	6	-.638*	.086	.000	-.904	-.371
	7	-.006	.006	1.000	-.026	.013
	1	-.162	.071	.500	-.382	.057
	2	.138*	.037	.005	.024	.251
	3	.256*	.050	.000	.100	.412
	5	-.388*	.085	.000	-.651	-.124
	6	-.381*	.102	.006	-.697	-.066
5	7	.250*	.051	.000	.092	.408
	1	.225	.106	.751	-.103	.553
	2	.525*	.085	.000	.261	.789
	3	.644*	.081	.000	.393	.895
	4	.388*	.085	.000	.124	.651
	6	.006	.120	1.000	-.363	.375
	7	.638*	.081	.000	.387	.888
6	1	.219	.091	.353	-.061	.498
	2	.519*	.092	.000	.235	.802
	3	.638*	.086	.000	.371	.904
	4	.381*	.102	.006	.066	.697
	5	-.006	.120	1.000	-.375	.363
	7	.631*	.086	.000	.366	.896
7	1	-.413*	.056	.000	-.585	-.240
	2	-.113*	.035	.036	-.221	-.004
	3	.006	.006	1.000	-.013	.026
	4	-.250*	.051	.000	-.408	-.092
	5	-.638*	.081	.000	-.888	-.387
	6	-.631*	.086	.000	-.896	-.366

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Multivariate Tests						
	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	.536	29.399 ^a	6.000	153.000	.000	.536
Wilks' lambda	.464	29.399 ^a	6.000	153.000	.000	.536
Hotelling's trace	1.153	29.399 ^a	6.000	153.000	.000	.536
Roy's largest root	1.153	29.399 ^a	6.000	153.000	.000	.536

Each F tests the multivariate effect of Clicks_Food. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

3. Task types * Clicks_Food					
Measure: MEASURE_1					
Task types	Clicks_Food	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Non-specific	1	.588	.079	.432	.743
	2	.000	.049	-.097	.097
	3	.000	.000	.000	.000
	4	.275	.071	.134	.416
	5	.938	.115	.711	1.164
	6	.775	.122	.534	1.016
	7	.013	.009	-.005	.030
Specific	1	.250	.079	.094	.406
	2	.238	.049	.140	.335
	3	.000	.000	.000	.000
	4	.238	.071	.096	.379
	5	.350	.115	.123	.577
	6	.500	.122	.259	.741
	7	.000	.009	-.017	.017

Appendix G: Repeated measures_Clicks_Travel

General Linear Model

Within-Subjects Factors	
Measure: MEASURE_1	
Clicks_Travel	Dependent Variable
1	Readmore_Travel
2	Image_Travel
3	Text_Travel
4	Olderpost_Travel
5	Header_Travel
6	Categories_Travel
7	Adclick_Travel

Between-Subjects Factors			
		Value Label	N
Task types	1	Non-specific	80
	2	Specific	80

Descriptive Statistics				
	Task types	Mean	Std. Deviation	N
Readmore clicks_Travel	Non-specific	.06	.244	80
	Specific	.01	.112	80
	Total	.04	.191	160
Image clicks_Travel	Non-specific	1.74	1.697	80
	Specific	1.47	1.882	80
	Total	1.61	1.791	160
Text clicks_Travel	Non-specific	.44	.777	80
	Specific	.55	.940	80
	Total	.49	.861	160
Olderpost clicks_Travel	Non-specific	.00	.000	80
	Specific	.00	.000	80
	Total	.00	.000	160
Header clicks_Travel	Non-specific	1.09	1.160	80
	Specific	.93	1.028	80
	Total	1.01	1.096	160

Categories click_Travel	Non-specific	.70	.960	80
	Specific	.29	.697	80
	Total	.49	.861	160
Ad clicks_Travel	Non-specific	.00	.000	80
	Specific	.00	.000	80
	Total	.00	.000	160

Multivariate Tests ^a				
Effect		Value	F	Hypothesis df Error df
Clicks_Travel	Pillai's Trace	.728	82.423 ^b	5.000 154.000
	Wilks' Lambda	.272	82.423 ^b	5.000 154.000
	Hotelling's Trace	2.676	82.423 ^b	5.000 154.000
	Roy's Largest Root	2.676	82.423 ^b	5.000 154.000
Clicks_Travel * Task	Pillai's Trace	.087	2.929 ^b	5.000 154.000
	Wilks' Lambda	.913	2.929 ^b	5.000 154.000
	Hotelling's Trace	.095	2.929 ^b	5.000 154.000
	Roy's Largest Root	.095	2.929 ^b	5.000 154.000

Multivariate Tests ^a			
Effect		Sig.	Partial Eta Squared
Clicks_Travel	Pillai's Trace	.000	.728
	Wilks' Lambda	.000	.728
	Hotelling's Trace	.000	.728
	Roy's Largest Root	.000	.728
Clicks_Travel * Task	Pillai's Trace	.015	.087
	Wilks' Lambda	.015	.087
	Hotelling's Trace	.015	.087
	Roy's Largest Root	.015	.087

a. Design: Intercept + Task

Within Subjects Design: Clicks_Travel

b. Exact statistic

Mauchly's Test of Sphericity ^a					
Measure: MEASURE_1					
Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon ^b Greenhouse-Geisser
Clicks_Travel	.000	.	20	.	.429

Mauchly's Test of Sphericity ^a					
Measure: MEASURE_1					

Within Subjects Effect	Huynh-Feldt	Epsilon
		Lower-bound
Clicks_Travel	.440	.167

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.^a

a. Design: Intercept + Task

Within Subjects Design: Clicks_Travel

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects					
Measure: MEASURE_1					
Source		Type III Sum of Squares	df	Mean Square	F
Clicks_Travel	Sphericity Assumed	350.618	6	58.436	68.572
	Greenhouse-Geisser	350.618	2.577	136.059	68.572
	Huynh-Feldt	350.618	2.640	132.812	68.572
	Lower-bound	350.618	1.000	350.618	68.572
Clicks_Travel * Task	Sphericity Assumed	7.793	6	1.299	1.524
	Greenhouse-Geisser	7.793	2.577	3.024	1.524
	Huynh-Feldt	7.793	2.640	2.952	1.524
	Lower-bound	7.793	1.000	7.793	1.524
Error(Clicks_Travel)	Sphericity Assumed	807.875	948	.852	
	Greenhouse-Geisser	807.875	407.158	1.984	
	Huynh-Feldt	807.875	417.115	1.937	
	Lower-bound	807.875	158.000	5.113	

Tests of Within-Subjects Effects		
Measure: MEASURE_1		
Source	Sig.	Partial Eta Squared
Clicks_Travel	Sphericity Assumed	.000
	Greenhouse-Geisser	.000
	Huynh-Feldt	.000
	Lower-bound	.000
Clicks_Travel * Task	Sphericity Assumed	.167
	Greenhouse-Geisser	.213
	Huynh-Feldt	.212
	Lower-bound	.219
Error(Clicks_Travel)	Sphericity Assumed	
	Greenhouse-Geisser	

Huynh-Feldt	
Lower-bound	

Tests of Within-Subjects Contrasts					
Measure: MEASURE_1					
Source	Clicks_Travel	Type III Sum of Squares	df	Mean Square	F
Clicks_Travel	Linear	19.032	1	19.032	28.218
	Quadratic	35.424	1	35.424	163.248
	Cubic	8.438	1	8.438	7.718
	Order 4	177.956	1	177.956	147.764
	Order 5	92.668	1	92.668	68.882
	Order 6	17.100	1	17.100	29.543
Clicks_Travel * Task	Linear	.258	1	.258	.383
	Quadratic	.005	1	.005	.022
	Cubic	1.504	1	1.504	1.376
	Order 4	5.318	1	5.318	4.416
	Order 5	.250	1	.250	.186
	Order 6	.457	1	.457	.790
Error(Clicks_Travel)	Linear	106.567	158	.674	
	Quadratic	34.285	158	.217	
	Cubic	172.725	158	1.093	
	Order 4	190.284	158	1.204	
	Order 5	212.558	158	1.345	
	Order 6	91.455	158	.579	

Tests of Within-Subjects Contrasts			
Measure: MEASURE_1			
Source	Clicks_Travel	Sig.	Partial Eta Squared
Clicks_Travel	Linear	.000	.152
	Quadratic	.000	.508
	Cubic	.006	.047
	Order 4	.000	.483
	Order 5	.000	.304
	Order 6	.000	.158
Clicks_Travel * Task	Linear	.537	.002
	Quadratic	.882	.000
	Cubic	.243	.009
	Order 4	.037	.027
	Order 5	.667	.001

	Order 6	.375	.005
Error(Clicks_Travel)	Linear		
	Quadratic		
	Cubic		
	Order 4		
	Order 5		
	Order 6		

Tests of Between-Subjects Effects						
Measure: MEASURE_1						
Transformed Variable: Average						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	302.432	1	302.432	385.824	.000	.709
Task	3.432	1	3.432	4.379	.038	.027
Error	123.850	158	.784			

Estimated Marginal Means

1. Clicks_Travel

Estimates				
Measure: MEASURE_1				
Clicks_Travel	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	.038	.015	.008	.067
2	1.606	.142	1.326	1.886
3	.494	.068	.359	.628
4	.000	.000	.000	.000
5	1.006	.087	.835	1.177
6	.494	.066	.363	.625
7	.000	.000	.000	.000

Pairwise Comparisons						
Measure: MEASURE_1						
		Mean			95% Confidence Interval for Difference ^b	
(I) Clicks_Travel	(J) Clicks_Travel	Difference (I-J)	Std. Error	Sig. ^b	Lower Bound	Upper Bound
1	2	-1.569*	.144	.000	-2.013	-1.124
	3	-.456*	.071	.000	-.675	-.238

	4	.038	.015	.280	-.009	.084
	5	-.969*	.090	.000	-1.246	-.691
	6	-.456*	.067	.000	-.662	-.250
	7	.038	.015	.280	-.009	.084
2	1	1.569*	.144	.000	1.124	2.013
	3	1.113*	.154	.000	.636	1.589
	4	1.606*	.142	.000	1.169	2.044
	5	.600*	.168	.010	.080	1.120
	6	1.113*	.160	.000	.618	1.607
	7	1.606*	.142	.000	1.169	2.044
3	1	.456*	.071	.000	.238	.675
	2	-1.113*	.154	.000	-1.589	-.636
	4	.494*	.068	.000	.283	.704
	5	-.513*	.114	.000	-.866	-.159
	6	.000	.095	1.000	-.294	.294
	7	.494*	.068	.000	.283	.704
4	1	-.038	.015	.280	-.084	.009
	2	-1.606*	.142	.000	-2.044	-1.169
	3	-.494*	.068	.000	-.704	-.283
	5	-1.006*	.087	.000	-1.274	-.739
	6	-.494*	.066	.000	-.699	-.289
	7	.000	.000	.	.000	.000
5	1	.969*	.090	.000	.691	1.246
	2	-.600*	.168	.010	-1.120	-.080
	3	.513*	.114	.000	.159	.866
	4	1.006*	.087	.000	.739	1.274
	6	.513*	.109	.000	.176	.849
	7	1.006*	.087	.000	.739	1.274
6	1	.456*	.067	.000	.250	.662
	2	-1.113*	.160	.000	-1.607	-.618
	3	.000	.095	1.000	-.294	.294
	4	.494*	.066	.000	.289	.699
	5	-.513*	.109	.000	-.849	-.176
	7	.494*	.066	.000	.289	.699
7	1	-.038	.015	.280	-.084	.009
	2	-1.606*	.142	.000	-2.044	-1.169
	3	-.494*	.068	.000	-.704	-.283
	4	.000	.000	.	.000	.000
	5	-1.006*	.087	.000	-1.274	-.739
	6	-.494*	.066	.000	-.699	-.289

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Multivariate Tests					
	Value	F	Hypothesis df	Error df	Sig.
Pillai's trace	.728	82.423 ^a	5.000	154.000	.000
Wilks' lambda	.272	82.423 ^a	5.000	154.000	.000
Hotelling's trace	2.676	82.423 ^a	5.000	154.000	.000
Roy's largest root	2.676	82.423 ^a	5.000	154.000	.000

Each F tests the multivariate effect of Clicks_Travel. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

2. Task types

Estimates				
Measure: MEASURE_1				
Task types	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Non-specific	.575	.037	.501	.649
Specific	.464	.037	.390	.538

Pairwise Comparisons					
Measure: MEASURE_1					
		Mean Difference	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b
(I) Task types	(J) Task types	(I-J)			Lower Bound
Non-specific	Specific	.111 [*]	.053	.038	.006
Specific	Non-specific	-.111 [*]	.053	.038	-.215

Pairwise Comparisons		
Measure: MEASURE_1		
(I) Task types	(J) Task types	95% Confidence Interval for Difference
		Upper Bound
Non-specific	Specific	.215
Specific	Non-specific	-.006

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests					
Measure: MEASURE_1					
	Sum of Squares	df	Mean Square	F	Sig.
Partial Eta Squared					
Contrast	.490	1	.490	4.379	.038
Error	17.693	158	.112		

The F tests the effect of Task types. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

3. Task types * Clicks_Travel					
Measure: MEASURE_1					
Task types	Clicks_Travel	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Non-specific	1	.063	.021	.021	.104
	2	1.738	.200	1.342	2.133
	3	.438	.096	.247	.628
	4	.000	.000	.000	.000
	5	1.088	.123	.845	1.330
	6	.700	.094	.515	.885
	7	.000	.000	.000	.000
Specific	1	.013	.021	-.029	.054
	2	1.475	.200	1.079	1.871
	3	.550	.096	.360	.740
	4	.000	.000	.000	.000
	5	.925	.123	.683	1.167
	6	.288	.094	.102	.473
	7	.000	.000	.000	.000

Appendix H: Repeated measures_Fixation_Food

General Linear Model

Within-Subjects Factors	
Measure: MEASURE_1	
	Dependent
Fixation_Food	Variable
1	Text_Food
2	Image_Food
3	Ad_Food
4	Categories_Food
5	Header_Food

Between-Subjects Factors			
		Value Label	N
Non-specific and specific	1	Non-specific	80
	2	Specific	80

Descriptive Statistics				
	Non-specific and specific	Mean	Std. Deviation	N
Text_fixn_Food	Non-specific	8.0313	7.05026	80
	Specific	6.5704	6.85654	80
	Total	7.3008	6.97079	160
Images_fixn_Food	Non-specific	3.3851	3.83908	80
	Specific	2.8383	2.66968	80
	Total	3.1117	3.30747	160
Ad_fixn_Food	Non-specific	2.2680	2.63176	80
	Specific	3.7375	3.61582	80
	Total	3.0028	3.23737	160
Categories_fixn_Food	Non-specific	4.0009	6.95838	80
	Specific	9.8231	11.27330	80
	Total	6.9120	9.78413	160
Header_fixn_Food	Non-specific	9.8699	7.13467	80
	Specific	5.0041	3.41828	80
	Total	7.4370	6.08715	160

Multivariate Tests ^a					
Effect		Value	F	Hypothesis df	Error df
Fixation_Food	Pillai's Trace	.510	40.341 ^b	4.000	155.000
	Wilks' Lambda	.490	40.341 ^b	4.000	155.000
	Hotelling's Trace	1.041	40.341 ^b	4.000	155.000
	Roy's Largest Root	1.041	40.341 ^b	4.000	155.000
Fixation_Food * Task	Pillai's Trace	.294	16.174 ^b	4.000	155.000
	Wilks' Lambda	.706	16.174 ^b	4.000	155.000
	Hotelling's Trace	.417	16.174 ^b	4.000	155.000
	Roy's Largest Root	.417	16.174 ^b	4.000	155.000

Multivariate Tests ^a			
Effect		Sig.	Partial Eta Squared
Fixation_Food	Pillai's Trace	.000	.510
	Wilks' Lambda	.000	.510
	Hotelling's Trace	.000	.510
	Roy's Largest Root	.000	.510
Fixation_Food * Task	Pillai's Trace	.000	.294
	Wilks' Lambda	.000	.294
	Hotelling's Trace	.000	.294
	Roy's Largest Root	.000	.294

a. Design: Intercept + Task

Within Subjects Design: Fixation_Food

b. Exact statistic

Mauchly's Test of Sphericity ^a					
Measure: MEASURE_1					
Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon ^b Greenhouse-Geisser
Fixation_Food	.231	228.976	9	.000	.583

Mauchly's Test of Sphericity ^a			
Measure: MEASURE_1			
Within Subjects Effect	Huynh-Feldt	Epsilon	Lower-bound
Fixation_Food	.596		.250

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.^a

a. Design: Intercept + Task

Within Subjects Design: Fixation_Food

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects					
Measure: MEASURE_1					
Source		Type III Sum of Squares	df	Mean Square	F
Fixation_Food	Sphericity Assumed	3346.395	4	836.599	26.759
	Greenhouse-Geisser	3346.395	2.334	1433.968	26.759
	Huynh-Feldt	3346.395	2.386	1402.641	26.759
	Lower-bound	3346.395	1.000	3346.395	26.759
Fixation_Food * Task	Sphericity Assumed	2485.272	4	621.318	19.874
	Greenhouse-Geisser	2485.272	2.334	1064.967	19.874
	Huynh-Feldt	2485.272	2.386	1041.702	19.874
	Lower-bound	2485.272	1.000	2485.272	19.874
Error(Fixation_Food)	Sphericity Assumed	19758.615	632	31.264	
	Greenhouse-Geisser	19758.615	368.718	53.587	
	Huynh-Feldt	19758.615	376.953	52.417	
	Lower-bound	19758.615	158.000	125.055	

Tests of Within-Subjects Effects		
Measure: MEASURE_1		
Source	Sig.	Partial Eta Squared
Fixation_Food	Sphericity Assumed	.000
	Greenhouse-Geisser	.000
	Huynh-Feldt	.000
	Lower-bound	.000
Fixation_Food * Task	Sphericity Assumed	.000
	Greenhouse-Geisser	.000
	Huynh-Feldt	.000
	Lower-bound	.000
Error(Fixation_Food)	Sphericity Assumed	
	Greenhouse-Geisser	
	Huynh-Feldt	
	Lower-bound	

Tests of Within-Subjects Contrasts					
Measure: MEASURE_1					
Source	Fixation_Food	Type III Sum of Squares	df	Mean Square	F
Fixation_Food	Linear	265.389	1	265.389	9.297
	Quadratic	2066.362	1	2066.362	54.455
	Cubic	891.485	1	891.485	22.206
	Order 4	123.159	1	123.159	6.687
Fixation_Food * Task	Linear	.777	1	.777	.027
	Quadratic	1244.165	1	1244.165	32.788
	Cubic	1042.402	1	1042.402	25.965
	Order 4	197.928	1	197.928	10.747
Error(Fixation_Food)	Linear	4510.251	158	28.546	
	Quadratic	5995.482	158	37.946	
	Cubic	6343.093	158	40.146	
	Order 4	2909.789	158	18.416	

Tests of Within-Subjects Contrasts			
Measure: MEASURE_1			
Source	Fixation_Food	Sig.	Partial Eta Squared
Fixation_Food	Linear	.003	.056
	Quadratic	.000	.256
	Cubic	.000	.123
	Order 4	.011	.041
Fixation_Food * Task	Linear	.869	.000
	Quadratic	.000	.172
	Cubic	.000	.141
	Order 4	.001	.064
Error(Fixation_Food)	Linear		
	Quadratic		
	Cubic		
	Order 4		

Tests of Between-Subjects Effects						
Measure: MEASURE_1						
Transformed Variable: Average						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	24667.314	1	24667.314	389.782	.000	.712
Task	1.399	1	1.399	.022	.882	.000
Error	9999.022	158	63.285			

Estimated Marginal Means

1. Non-specific and specific

Estimates				
Measure: MEASURE_1				
	Mean	Std. Error	95% Confidence Interval	
Non-specific and specific			Lower Bound	Upper Bound
Non-specific	5.511	.398	4.725	6.297
Specific	5.595	.398	4.809	6.380

Pairwise Comparisons				
Measure: MEASURE_1				
(I) Non-specific and specific	(J) Non-specific and specific	Mean Difference (I-J)	Std. Error	Sig. ^a
Non-specific	Specific	-.084	.563	.882
Specific	Non-specific	.084	.563	.882

Pairwise Comparisons				
Measure: MEASURE_1				
(I) Non-specific and specific	(J) Non-specific and specific	95% Confidence Interval for Difference ^a		
		Lower Bound	Upper Bound	
Non-specific	Specific	-1.195	1.027	
Specific	Non-specific	-1.027	1.195	

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests					
Measure: MEASURE_1					
	Sum of Squares	df	Mean Square	F	Sig.
					Partial Eta Squared

Contrast	.280	1	.280	.022	.882	.000
Error	1999.804	158	12.657			

The F tests the effect of Non-specific and specific. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

2. Fixation_Food

Estimates				
Measure: MEASURE_1				
Fixation_Food	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	7.301	.550	6.215	8.387
2	3.112	.261	2.595	3.628
3	3.003	.250	2.509	3.497
4	6.912	.741	5.449	8.375
5	7.437	.442	6.564	8.310

Pairwise Comparisons					
Measure: MEASURE_1					
(I) Fixation_Food	(J) Fixation_Food	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b Lower Bound
1	2	4.189*	.498	.000	2.771
	3	4.298*	.609	.000	2.564
	4	.389	.905	1.000	-2.189
	5	-.136	.499	1.000	-1.556
2	1	-4.189*	.498	.000	-5.608
	3	.109	.350	1.000	-.889
	4	-3.800*	.781	.000	-6.024
	5	-4.325*	.377	.000	-5.398
3	1	-4.298*	.609	.000	-6.032
	2	-.109	.350	1.000	-1.107
	4	-3.909*	.691	.000	-5.877
	5	-4.434*	.494	.000	-5.839
4	1	-.389	.905	1.000	-2.967
	2	3.800*	.781	.000	1.577
	3	3.909*	.691	.000	1.941
	5	-.525	.790	1.000	-2.773
5	1	.136	.499	1.000	-1.283

2	4.325*	.377	.000	3.253
3	4.434*	.494	.000	3.029
4	.525	.790	1.000	-1.723

Pairwise Comparisons		
Measure: MEASURE_1		
(I) Fixation_Food	(J) Fixation_Food	95% Confidence Interval for Difference Upper Bound
1	2	5.608
	3	6.032
	4	2.967
	5	1.283
2	1	-2.771
	3	1.107
	4	-1.577
	5	-3.253
3	1	-2.564
	2	.889
	4	-1.941
	5	-3.029
4	1	2.189
	2	6.024
	3	5.877
	5	1.723
5	1	1.556
	2	5.398
	3	5.839
	4	2.773

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Multivariate Tests						
	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	.510	40.341 ^a	4.000	155.000	.000	.510
Wilks' lambda	.490	40.341 ^a	4.000	155.000	.000	.510

Hotelling's trace	1.041	40.341 ^a	4.000	155.000	.000	.510
Roy's largest root	1.041	40.341 ^a	4.000	155.000	.000	.510

Each F tests the multivariate effect of Fixation_Food. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

3. Non-specific and specific * Fixation_Food					
Measure: MEASURE_1					
Non-specific and specific	Fixation_Food	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Non-specific	1	8.031	.777	6.496	9.567
	2	3.385	.370	2.655	4.115
	3	2.268	.354	1.570	2.966
	4	4.001	1.047	1.932	6.069
	5	9.870	.625	8.635	11.105
Specific	1	6.570	.777	5.035	8.106
	2	2.838	.370	2.108	3.568
	3	3.738	.354	3.039	4.436
	4	9.823	1.047	7.755	11.892
	5	5.004	.625	3.769	6.239

Appendix I: Repeated measures_Fixation_Travel

General Linear Model

Within-Subjects Factors	
Measure: MEASURE_1	
Fixation_Travel	Dependent Variable
1	Text_Travel
2	Image_Travel
3	Ad_Travel
4	Categories_Travel
5	Header_Travel

Between-Subjects Factors			
	Value Label		N
Non-specific and specific	1	Non-specific	80
	2	Specific	80

Descriptive Statistics				
	Non-specific and specific	Mean	Std. Deviation	N
Text_fixn_Travel	Non-specific	2.7000	3.15854	80
	Specific	2.8249	3.30147	80
	Total	2.7624	3.22123	160
Image_fixn_Travel	Non-specific	8.7491	8.34634	80
	Specific	16.5238	16.22152	80
	Total	12.6364	13.43723	160
Ad_fixn_Travel	Non-specific	.1220	.43102	80
	Specific	.0744	.22369	80
	Total	.0982	.34313	160
Categories_fixn_Travel	Non-specific	.4642	1.39162	80
	Specific	.3560	1.18822	80
	Total	.4101	1.29099	160
Header_fixn_Travel	Non-specific	4.1085	3.53709	80
	Specific	6.3593	5.11394	80
	Total	5.2339	4.52599	160

Multivariate Tests ^a					
Effect		Value	F	Hypothesis df	Error df
Fixation_Travel	Pillai's Trace	.683	83.376 ^b	4.000	155.000
	Wilks' Lambda	.317	83.376 ^b	4.000	155.000
	Hotelling's Trace	2.152	83.376 ^b	4.000	155.000
	Roy's Largest Root	2.152	83.376 ^b	4.000	155.000
Fixation_Travel * Task	Pillai's Trace	.134	6.003 ^b	4.000	155.000
	Wilks' Lambda	.866	6.003 ^b	4.000	155.000
	Hotelling's Trace	.155	6.003 ^b	4.000	155.000
	Roy's Largest Root	.155	6.003 ^b	4.000	155.000

Multivariate Tests ^a			
Effect		Sig.	Partial Eta Squared
Fixation_Travel	Pillai's Trace	.000	.683
	Wilks' Lambda	.000	.683
	Hotelling's Trace	.000	.683
	Roy's Largest Root	.000	.683
Fixation_Travel * Task	Pillai's Trace	.000	.134
	Wilks' Lambda	.000	.134
	Hotelling's Trace	.000	.134
	Roy's Largest Root	.000	.134

a. Design: Intercept + Task

Within Subjects Design: Fixation_Travel

b. Exact statistic

Mauchly's Test of Sphericity ^a					
Measure: MEASURE_1					
Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon ^b Greenhouse-Geisser
Fixation_Travel	.004	878.598	9	.000	.335

Mauchly's Test of Sphericity ^a			
Measure: MEASURE_1			
Within Subjects Effect	Huynh-Feldt	Epsilon	Lower-bound
Fixation_Travel	.339	.339	.250

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.^a

a. Design: Intercept + Task

Within Subjects Design: Fixation_Travel

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects				
Measure: MEASURE_1				
Source		Type III Sum of Squares	df	Mean Square
Fixation_Travel	Sphericity Assumed	16878.880	4	4219.720
	Greenhouse-Geisser	16878.880	1.341	12586.506
	Huynh-Feldt	16878.880	1.357	12439.634
	Lower-bound	16878.880	1.000	16878.880
Fixation_Travel * Task	Sphericity Assumed	1822.510	4	455.627
	Greenhouse-Geisser	1822.510	1.341	1359.037
	Huynh-Feldt	1822.510	1.357	1343.179
	Lower-bound	1822.510	1.000	1822.510
Error(Fixation_Travel)	Sphericity Assumed	22622.972	632	35.796
	Greenhouse-Geisser	22622.972	211.883	106.771
	Huynh-Feldt	22622.972	214.384	105.525
	Lower-bound	22622.972	158.000	143.183

Tests of Within-Subjects Effects				
Measure: MEASURE_1				
Source		F	Sig.	Partial Eta Squared
Fixation_Travel	Sphericity Assumed	117.883	.000	.427
	Greenhouse-Geisser	117.883	.000	.427
	Huynh-Feldt	117.883	.000	.427
	Lower-bound	117.883	.000	.427
Fixation_Travel * Task	Sphericity Assumed	12.729	.000	.075
	Greenhouse-Geisser	12.729	.000	.075
	Huynh-Feldt	12.729	.000	.075
	Lower-bound	12.729	.000	.075
Error(Fixation_Travel)	Sphericity Assumed			
	Greenhouse-Geisser			
	Huynh-Feldt			
	Lower-bound			

Tests of Within-Subjects Contrasts					
Measure: MEASURE_1					
Source	Fixation_Travel	Type III Sum of Squares	df	Mean Square	F

Fixation_Travel	Linear	848.775	1	848.775	27.780
	Quadratic	86.409	1	86.409	7.630
	Cubic	11598.482	1	11598.482	174.356
	Order 4	4345.213	1	4345.213	124.926
Fixation_Travel * Task	Linear	52.740	1	52.740	1.726
	Quadratic	22.719	1	22.719	2.006
	Cubic	1280.441	1	1280.441	19.248
	Order 4	466.609	1	466.609	13.415
Error(Fixation_Travel)	Linear	4827.524	158	30.554	
	Quadratic	1789.367	158	11.325	
	Cubic	10510.476	158	66.522	
	Order 4	5495.606	158	34.782	

Tests of Within-Subjects Contrasts			
Measure: MEASURE_1			
Source	Fixation_Travel	Sig.	Partial Eta Squared
Fixation_Travel	Linear	.000	.150
	Quadratic	.006	.046
	Cubic	.000	.525
	Order 4	.000	.442
Fixation_Travel * Task	Linear	.191	.011
	Quadratic	.159	.013
	Cubic	.000	.109
	Order 4	.000	.078
Error(Fixation_Travel)	Linear		
	Quadratic		
	Cubic		
	Order 4		

Tests of Between-Subjects Effects						
Measure: MEASURE_1						
Transformed Variable: Average						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	14302.225	1	14302.225	261.094	.000	.623
Task	799.100	1	799.100	14.588	.000	.085
Error	8654.935	158	54.778			

Estimated Marginal Means

1. Fixation_Travel

Estimates				
Measure: MEASURE_1				
Fixation_Travel	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	2.762	.255	2.258	3.267
2	12.636	1.020	10.622	14.651
3	.098	.027	.045	.152
4	.410	.102	.208	.612
5	5.234	.348	4.547	5.920

Pairwise Comparisons					
Measure: MEASURE_1					
(I) Fixation_Travel	(J) Fixation_Travel	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b
					Lower Bound
1	2	-9.874*	.918	.000	-12.489
	3	2.664*	.257	.000	1.934
	4	2.352*	.272	.000	1.578
	5	-2.471*	.406	.000	-3.628
2	1	9.874*	.918	.000	7.259
	3	12.538*	1.019	.000	9.636
	4	12.226*	1.024	.000	9.311
	5	7.403*	.996	.000	4.567
3	1	-2.664*	.257	.000	-3.395
	2	-12.538*	1.019	.000	-15.440
	4	-.312*	.090	.007	-.567
	5	-5.136*	.342	.000	-6.110
4	1	-2.352*	.272	.000	-3.126
	2	-12.226*	1.024	.000	-15.142
	3	.312*	.090	.007	.056
	5	-4.824*	.348	.000	-5.816
5	1	2.471*	.406	.000	1.315
	2	-7.403*	.996	.000	-10.238
	3	5.136*	.342	.000	4.161
	4	4.824*	.348	.000	3.832

--	--	--	--

Pairwise Comparisons		
Measure: MEASURE_1		
(I) Fixation_Travel	(J) Fixation_Travel	95% Confidence Interval for Difference Upper Bound
1	2	-7.259
	3	3.395
	4	3.126
	5	-1.315
2	1	12.489
	3	15.440
	4	15.142
	5	10.238
3	1	-1.934
	2	-9.636
	4	-.056
	5	-4.161
4	1	-1.578
	2	-9.311
	3	.567
	5	-3.832
5	1	3.628
	2	-4.567
	3	6.110
	4	5.816

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Multivariate Tests						
	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	.683	83.376 ^a	4.000	155.000	.000	.683
Wilks' lambda	.317	83.376 ^a	4.000	155.000	.000	.683
Hotelling's trace	2.152	83.376 ^a	4.000	155.000	.000	.683
Roy's largest root	2.152	83.376 ^a	4.000	155.000	.000	.683

Each F tests the multivariate effect of Fixation_Travel. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

2. Non-specific and specific

Estimates				
Measure: MEASURE_1				
	Mean	Std. Error	95% Confidence Interval	
Non-specific and specific			Lower Bound	Upper Bound
Non-specific	3.229	.370	2.498	3.960
Specific	5.228	.370	4.497	5.959

Pairwise Comparisons				
Measure: MEASURE_1				
(I) Non-specific and specific	(J) Non-specific and specific	Mean Difference (I-J)	Std. Error	Sig. ^b
Non-specific	Specific	-1.999*	.523	.000
Specific	Non-specific	1.999*	.523	.000

Pairwise Comparisons				
Measure: MEASURE_1				
(I) Non-specific and specific	(J) Non-specific and specific	95% Confidence Interval for Difference ^b		
		Lower Bound	Upper Bound	
Non-specific	Specific	-3.033	-.965	
Specific	Non-specific	.965	3.033	

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests					
Measure: MEASURE_1					
	Sum of Squares	df	Mean Square	F	Sig.
Contrast	159.820	1	159.820	14.588	.000
Error	1730.987	158	10.956		

The F tests the effect of Non-specific and specific. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

3. Non-specific and specific * Fixation_Travel

Measure: MEASURE_1

Non-specific and specific	Fixation_Travel	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Non-specific	1	2.700	.361	1.987	3.413
	2	8.749	1.442	5.901	11.598
	3	.122	.038	.046	.198
	4	.464	.145	.179	.750
	5	4.109	.492	3.138	5.079
Specific	1	2.825	.361	2.111	3.538
	2	16.524	1.442	13.675	19.372
	3	.074	.038	-.001	.150
	4	.356	.145	.070	.642
	5	6.359	.492	5.388	7.330

Appendix J: Posthoc paired samples test_Clicks and Task

T-Test

		Paired Samples Statistics			
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Readmore clicks_Food_non specific	.59	80	.852	.095
	Readmore_Food_specific	.25	80	.516	.058
Pair 2	Image clicks_Food_non specific	.00	80	.000	.000
	Image_Food_specific	.24	80	.621	.069
Pair 3	Textclicks_Food_non specific	.00 ^a	80	.000	.000
	Text_Food_specific	.00 ^a	80	.000	.000
Pair 4	Oldernews clicks_Food_non specific	.28	80	.656	.073
	Olderpost_Food_specific	.24	80	.621	.069
Pair 5	Headers clicks_Food_non specific	.94	80	1.306	.146
	Header_Food_specific	.35	80	.638	.071
Pair 6	Categories clicks_Food_non specific	.78	80	1.292	.144
	Categories_Food_specific	.50	80	.842	.094
Pair 7	Advertclicks_Food_non-specific	.01	80	.112	.013
	Advert_Food_specific	.00	80	.000	.000
Pair 8	Readmore clicks_Trave_non-specific	.06	80	.244	.027
	Readmore_Travel_specific	.01	80	.112	.013
Pair 9	Image clicks_Travel_non-specific	1.74	80	1.697	.190
	Image_Travel_specific	1.48	80	1.882	.210
Pair 10	Text clicks_Travel_non-specific	.44	80	.777	.087
	Text_Travel_specific	.55	80	.940	.105
Pair 11	Olderpost clicks_Travel_non-specific	.00 ^a	80	.000	.000
	Olderpost_Travel_specific	.00 ^a	80	.000	.000
Pair 12	Categories click_Travel_non-specific	.70	80	.960	.107
	Categories_Travel_specific	.29	80	.697	.078

Pair 13	Ad clicks_Travel_non-specific	.00 ^a	80	.000	.000
	Advert-Travel_specific	.00 ^a	80	.000	.000
Pair 14	Header clicks_Travel_non-specific	1.09	80	1.160	.130
	Header_Travel_specific	.93	80	1.028	.115

a. The correlation and t cannot be computed because the standard error of the difference is 0.

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Readmore clicks_Food_non specific & Readmore_Food_specific	80	.151	.181
Pair 2	Image clicks_Food_non specific & Image_Food_specific	80	.	.
Pair 4	Oldernews clicks_Food_non specific & Olderpost_Food_specific	80	-.131	.246
Pair 5	Headers clicks_Food_non specific & Header_Food_specific	80	-.156	.168
Pair 6	Categories clicks_Food_non specific & Categories_Food_specific	80	-.151	.181
Pair 7	Advertclicks_Food_non-specific & Advert_Food_specific	80	.	.
Pair 8	Readmore clicks_Trave_non-specific & Readmore_Travel_specific	80	-.029	.798
Pair 9	Image clicks_Travel_non-specific & Image_Travel_specific	80	.024	.835
Pair 10	Text clicks_Travel_non-specific & Text_Travel_specific	80	.186	.098
Pair 12	Categories click_Travel_non-specific & Categories_Travel_specific	80	.017	.881

Pair 14	Header clicks_Travel_non-specific & Header_Travel_specific	80	.006	.961
---------	---	----	------	------

Paired Samples Test				
		Paired Differences		
		Mean	Std. Deviation	95% Confidence Interval of the Difference
				Lower
Pair 1	Readmore clicks_Food_non-specific - Readmore_Food_specific	.338	.927	.131
Pair 2	Image clicks_Food_non-specific - Image_Food_specific	-.238	.621	-.376
Pair 4	Oldernews clicks_Food_non-specific - Olderpost_Food_specific	.038	.961	-.176
Pair 5	Headers clicks_Food_non-specific - Header_Food_specific	.588	1.540	.245
Pair 6	Categories clicks_Food_non-specific - Categories_Food_specific	.275	1.646	-.091
Pair 7	Advertclicks_Food_non-specific - Advert_Food_specific	.013	.112	-.012
Pair 8	Readmore clicks_Trave_non-specific - Readmore_Travel_specific	.050	.271	-.010
Pair 9	Image clicks_Travel_non-specific - Image_Travel_specific	.262	2.504	-.295
Pair 10	Text clicks_Travel_non-specific - Text_Travel_specific	-.113	1.102	-.358
Pair 12	Categories click_Travel_non-specific - Categories_Travel_specific	.413	1.177	.151

Pair 14	Header clicks_Travel_non-specific - Header_Travel_specific	.162	1.546	.173	-.182
Paired Samples Test Paired Differences 95% Confidence Interval of the Difference Upper					
			t	df	Sig. (2-tailed)
Pair 1	Readmore clicks_Food_non specific - Readmore_Food_specific	.544	3.256	79	.002
Pair 2	Image clicks_Food_non specific - Image_Food_specific	-.099	-3.419	79	.001
Pair 4	Oldernews clicks_Food_non specific - Olderpost_Food_specific	.251	.349	79	.728
Pair 5	Headers clicks_Food_non specific - Header_Food_specific	.930	3.412	79	.001
Pair 6	Categories clicks_Food_non specific - Categories_Food_specific	.641	1.495	79	.139
Pair 7	Advertclicks_Food_non-specific - Advert_Food_specific	.037	1.000	79	.320
Pair 8	Readmore clicks_Trave_non-specificl - Readmore_Travel_specific	.110	1.650	79	.103
Pair 9	Image clicks_Travel_non-specific - Image_Travel_specific	.820	.938	79	.351
Pair 10	Text clicks_Travel_non-specific - Text_Travel_specific	.133	-.913	79	.364
Pair 12	Categories click_Travel_non-specific - Categories_Travel_specific	.674	3.135	79	.002
Pair 14	Header clicks_Travel_non-specific - Header_Travel_specific	.507	.940	79	.350

Appendix K: Posthoc paired samples test_Fixations and Task

T-Test

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Text_fixn_Food_Nonspecific	8.0312	80	7.05026	.78824
	Text_fixn_Food_Spec	6.5704	80	6.85654	.76658
Pair 2	Images_fixn_Food_Nonspecific	3.3851	80	3.83908	.42922
	Image_fixn_Food_Spec	2.8382	80	2.66968	.29848
Pair 3	Advert_fixn_Food_Nonspecific	2.2680	80	2.63176	.29424
	Advert_Food_Spec	3.7375	80	3.61582	.40426
Pair 4	Categories_fixn_Food_Nonspecific	4.0009	80	6.95838	.77797
	Categories_Food_Sec	9.8231	80	11.27330	1.26039
Pair 5	Header_fixn_Food_Nonspecific	9.8699	80	7.13467	.79768
	Header_Food_Spec	5.0041	80	3.41828	.38217
Pair 6	Text_fixn_Travel_Nonspecific	2.7000	80	3.15854	.35314
	Text_Travel_Spec	2.8249	80	3.30147	.36912
Pair 7	Image_fixn_Travel_Nonspecific	8.7491	80	8.34634	.93315
	Image_Travel_Spec	16.5238	80	16.22152	1.81362
Pair 8	Advert_fixn_Travel_Nonspecific	.1220	80	.43102	.04819
	Advert_Travel_Spec	.0744	80	.22369	.02501
Pair 9	Categories_fixn_Travel_Nonspecific	.4643	80	1.39162	.15559
	Categories_Travel_Spec	.3560	80	1.18822	.13285
Pair 10	Header_fixn_Travel_Nonspecific	4.1085	80	3.53709	.39546
	Header_Travel_Spec	6.3593	80	5.11394	.57176

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Text_fixn_Food_Nonspecific & Text_fixn_Food_Spec	80	.011	.922
Pair 2	Images_fixn_Food_Nonspecific & Image_fixn_Food_Spec	80	.097	.394
Pair 3	Advert_fixn_Food_Nonspecific & Advert_Food_Spec	80	.140	.217
Pair 4	Categories_fixn_Food_Nonspecific & Categories_Food_Sec	80	.238	.034

Pair 5	Header_fixn_Food_Nonspecific & Header_Food_Spec	80	.200	.076
Pair 6	Text_fixn_Travel_Nonspecific & Text_Travel_Spec	80	-.001	.992
Pair 7	Image_fixn_Travel_Nonspecific & Image_Travel_Spec	80	.172	.128
Pair 8	Advert_fixn_Travel_Nonspecific & Advert_Travel_Spec	80	-.002	.984
Pair 9	Categories_fixn_Travel_Nonspecific & Categories_Travel_Spec	80	.180	.109
Pair 10	Header_fixn_Travel_Nonspecific & Header_Travel_Spec	80	-.088	.436

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Text_fixn_Food_Nonspecific - Text_fixn_Food_Spec	1.46087	9.77992	1.09343	-.71554	3.63729	1.336	79	.185
Pair 2	Images_fixn_Food_Nonspecific - Image_fixn_Food_Spec	.54688	4.45935	.49857	-.44550	1.53925	1.097	79	.276
Pair 3	Advert_fixn_Food_Nonspecific - Advert_Food_Spec	-1.46950	4.16451	.46561	-2.39627	-.54273	-3.156	79	.002
Pair 4	Categories_fixn_Food_Nonspecific - Categories_Food_Sec	-5.82225	11.75526	1.31428	-8.43825	-3.20625	-4.430	79	.000
Pair 5	Header_fixn_Food_Nonspecific - Header_Food_Spec	4.86575	7.27018	.81283	3.24785	6.48365	5.986	79	.000
Pair 6	Text_fixn_Travel_Nonspecific - Text_Travel_Spec	-.12487	4.57172	.51113	-1.14226	.89251	-.244	79	.808
Pair 7	Image_fixn_Travel_Nonspecific - Image_Travel_Spec	-7.77463	16.92100	1.89183	-11.54021	-4.00904	-4.110	79	.000
Pair 8	Advert_fixn_Travel_Nonspecific - Advert_Travel_Spec	.04763	.48607	.05434	-.06054	.15579	.876	79	.383
Pair 9	Categories_fixn_Travel_Nonspecific - Categories_Travel_Spec	.10825	1.65887	.18547	-.26091	.47741	.584	79	.561
Pair 10	Header_fixn_Travel_Nonspecific - Header_Travel_Spec	-2.25075	6.46998	.72337	-3.69057	-.81093	-3.111	79	.003

Appendix L: Repeated measures and Posthoc_ Webpages visited

Descriptives									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Webpages visited_Food	Non-specific	80	4.74	3.018	.337	4.07	5.41	1	14
	Specific	80	2.83	2.036	.228	2.37	3.28	1	10
	Total	160	3.78	2.740	.217	3.35	4.21	1	14
Webpages visited_Travel	Non-specific	80	6.4000	3.24369	.36266	5.6782	7.1218	1.00	15.00
	Specific	80	5.1375	2.99681	.33505	4.4706	5.8044	1.00	15.00
	Total	160	5.7688	3.17661	.25113	5.2728	6.2647	1.00	15.00

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Webpages visited_Food	Between Groups	146.306	1	146.306	22.078	.000
	Within Groups	1047.037	158	6.627		
	Total	1193.344	159			
Webpages visited_Travel	Between Groups	63.756	1	63.756	6.538	.011
	Within Groups	1540.688	158	9.751		
	Total	1604.444	159			

2-way repeated measure - Webpages visited

General Linear Model

Within-Subjects Factors		
Measure: MEASURE_1		
Webpages	Websites	Dependent Variable
1	1	Pgs_Food_Specific
	2	Pgs_Food_Nonspec
2	1	Pgs_Travel_Specifi
	2	Pgs_Travel_Nonspec

Descriptive Statistics			
	Mean	Std. Deviation	N
Webpages_Food_Specific	2.8250	2.03622	80
Webpages_Food_Non-spec	4.7375	3.01785	80
Webpages_Travel_Specific	5.1375	2.99681	80
Webpages_Travel_Non-spec	6.4000	3.24369	80

Multivariate Tests ^a							
Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Webpages	Pillai's Trace	.328	38.497 ^b	1.000	79.000	.000	.328
	Wilks' Lambda	.672	38.497 ^b	1.000	79.000	.000	.328
	Hotelling's Trace	.487	38.497 ^b	1.000	79.000	.000	.328
	Roy's Largest Root	.487	38.497 ^b	1.000	79.000	.000	.328
Websites	Pillai's Trace	.254	26.864 ^b	1.000	79.000	.000	.254
	Wilks' Lambda	.746	26.864 ^b	1.000	79.000	.000	.254
	Hotelling's Trace	.340	26.864 ^b	1.000	79.000	.000	.254
	Roy's Largest Root	.340	26.864 ^b	1.000	79.000	.000	.254
Webpages * Websites	Pillai's Trace	.013	1.024 ^b	1.000	79.000	.315	.013
	Wilks' Lambda	.987	1.024 ^b	1.000	79.000	.315	.013
	Hotelling's Trace	.013	1.024 ^b	1.000	79.000	.315	.013
	Roy's Largest Root	.013	1.024 ^b	1.000	79.000	.315	.013

a. Design: Intercept

Within Subjects Design: Webpages + Websites + Webpages * Websites

b. Exact statistic

Mauchly's Test of Sphericity ^a							
Measure: MEASURE_1							
Within Subjects Effect		Mauchly's W	Approx. Chi-Square	df	Sig.	Greenhouse-Geisser	Epsilon ^b Huynh-Feldt Lower bound
Webpages		1.000	.000	0	.	1.000	1.000 1.000 1.000

Websites	1.000	.000	0	.	1.000	1.000	1.000
Webpages * Websites	1.000	.000	0	.	1.000	1.000	1.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept

Within Subjects Design: Webpages + Websites + Webpages * Websites

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects							
Measure: MEASURE_1							
Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Webpages	Sphericity Assumed	316.012	1	316.012	38.497	.000	.328
	Greenhouse-Geisser	316.012	1.000	316.012	38.497	.000	.328
	Huynh-Feldt	316.012	1.000	316.012	38.497	.000	.328
	Lower-bound	316.012	1.000	316.012	38.497	.000	.328
Error(Webpages)	Sphericity Assumed	648.488	79	8.209			
	Greenhouse-Geisser	648.488	79.000	8.209			
	Huynh-Feldt	648.488	79.000	8.209			
	Lower-bound	648.488	79.000	8.209			
Websites	Sphericity Assumed	201.612	1	201.612	26.864	.000	.254
	Greenhouse-Geisser	201.612	1.000	201.612	26.864	.000	.254
	Huynh-Feldt	201.612	1.000	201.612	26.864	.000	.254
	Lower-bound	201.612	1.000	201.612	26.864	.000	.254
Error(Websites)	Sphericity Assumed	592.887	79	7.505			
	Greenhouse-Geisser	592.887	79.000	7.505			
	Huynh-Feldt	592.887	79.000	7.505			
	Lower-bound	592.887	79.000	7.505			
Webpages * Websites	Sphericity Assumed	8.450	1	8.450	1.024	.315	.013
	Greenhouse-Geisser	8.450	1.000	8.450	1.024	.315	.013
	Huynh-Feldt	8.450	1.000	8.450	1.024	.315	.013
	Lower-bound	8.450	1.000	8.450	1.024	.315	.013
Error(Webpages*Websites)	Sphericity Assumed	652.050	79	8.254			
	Greenhouse-Geisser	652.050	79.000	8.254			
	Huynh-Feldt	652.050	79.000	8.254			
	Lower-bound	652.050	79.000	8.254			

Tests of Within-Subjects Contrasts								
Measure: MEASURE_1								
Source	Webpages	Websites	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Webpages	Linear		316.013	1	316.013	38.497	.000	.328
Error(Webpages)	Linear		648.488	79	8.209			
Websites		Linear	201.613	1	201.613	26.864	.000	.254
Error(Websites)		Linear	592.888	79	7.505			
Webpages * Websites	Linear	Linear	8.450	1	8.450	1.024	.315	.013
Error(Webpages*Websites)	Linear	Linear	652.050	79	8.254			

Tests of Between-Subjects Effects						
Measure: MEASURE_1						
Transformed Variable: Average						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	7296.200	1	7296.200	830.188	.000	.913
Error	694.300	79	8.789			

Estimated Marginal Means

1. Websites

Estimates				
Measure: MEASURE_1				
Websites	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	3.981	.216	3.551	4.411
2	5.569	.235	5.101	6.036

Pairwise Comparisons						
Measure: MEASURE_1						
		Mean Difference			95% Confidence Interval for Difference ^b	
(I) Websites	(J) Websites	(I-J)	Std. Error	Sig. ^b	Lower Bound	Upper Bound
1	2	-1.588 [*]	.306	.000	-2.197	-.978

2	1	1.588*	.306	.000	.978	2.197
---	---	--------	------	------	------	-------

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Multivariate Tests						
	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	.254	26.864 ^a	1.000	79.000	.000	.254
Wilks' lambda	.746	26.864 ^a	1.000	79.000	.000	.254
Hotelling's trace	.340	26.864 ^a	1.000	79.000	.000	.254
Roy's largest root	.340	26.864 ^a	1.000	79.000	.000	.254

Each F tests the multivariate effect of Websites. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

2. Webpages

Estimates				
Measure: MEASURE_1				
Webpages	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	3.781	.199	3.385	4.178
2	5.769	.258	5.255	6.282

Pairwise Comparisons						
Measure: MEASURE_1						
		Mean Difference	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
(I) Webpages	(J) Webpages	(I-J)			Lower Bound	Upper Bound
1	2	-1.988*	.320	.000	-2.625	-1.350
2	1	1.988*	.320	.000	1.350	2.625

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Multivariate Tests					
	Value	F	Hypothesis df	Error df	Partial Eta Squared
Pillai's trace	.328	38.497 ^a	1.000	79.000	.000
Wilks' lambda	.672	38.497 ^a	1.000	79.000	.000
Hotelling's trace	.487	38.497 ^a	1.000	79.000	.000
Roy's largest root	.487	38.497 ^a	1.000	79.000	.000

Each F tests the multivariate effect of Webpages. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

3. Webpages * Websites					
Measure: MEASURE_1					
Webpages	Websites	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
1	1	2.825	.228	2.372	3.278
	2	4.738	.337	4.066	5.409
2	1	5.138	.335	4.471	5.804
	2	6.400	.363	5.678	7.122

POST-HOC PAIRED SAMPLE T-TEST T-Test

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Webpages_Food_Specific	2.8250	80	2.03622	.22766
	Webpages_Food_Non-spec	4.7375	80	3.01785	.33741
Pair 2	Webpages_Travel_Specific	5.1375	80	2.99681	.33505
	Webpages_Travel_Non-spec	6.4000	80	3.24369	.36266
Pair 3	Webpages_Food_Specific	2.8250	80	2.03622	.22766
	Webpages_Travel_Specific	5.1375	80	2.99681	.33505
Pair 4	Webpages_Food_Non-spec	4.7375	80	3.01785	.33741
	Webpages_Travel_Non-spec	6.4000	80	3.24369	.36266

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Webpages_Food_Specific & Webpages_Food_Non-spec	80	-.045	.694
Pair 2	Webpages_Travel_Specific & Webpages_Travel_Non-spec	80	.092	.417
Pair 3	Webpages_Food_Specific & Webpages_Travel_Specific	80	.149	.187
Pair 4	Webpages_Food_Non-spec & Webpages_Travel_Non-spec	80	-.102	.370

Paired Samples Test					
		Paired Differences			95% Confidence Interval of the Difference
		Mean	Std. Deviation	Std. Error Mean	Lower
Pair 1	Webpages_Food_Specific - Webpages_Food_Non-spec	-1.91250	3.71515	.41537	-2.73927
Pair 2	Webpages_Travel_Specific - Webpages_Travel_Non-spec	-1.26250	4.20892	.47057	-2.19915
Pair 3	Webpages_Food_Specific - Webpages_Travel_Specific	-2.31250	3.36247	.37594	-3.06078
Pair 4	Webpages_Food_Non-spec - Webpages_Travel_Non-spec	-1.66250	4.64961	.51984	-2.69722

Paired Samples Test					
		Paired Differences	95% Confidence Interval of the Difference		Sig. (2-tailed)
		Upper	t	df	
Pair 1	Webpages_Food_Specific - Webpages_Food_Non-spec	-1.08573	-4.604	79	.000
Pair 2	Webpages_Travel_Specific - Webpages_Travel_Non-spec	-.32585	-2.683	79	.009

Pair 3	Webpages_Food_ Specific - Webpages_Travel_ Specific	-1.56422	-6.151	79	.000
Pair 4	Webpages_Food_ Non-spec - Webpages_Travel Non-spec	-.62778	-3.198	79	.002

Appendix M: Regression_Food website

Topical knowledge > Task difficulty, task type > Food website evaluation

Regression

Descriptive Statistics			
	Mean	Std. Deviation	N
Credibility rate- food web-blog	4.02	1.407	160
Topical knowledge_Food	1.66	.474	160
Non-specific and Specific	1.50	.502	160
Task difficulty - Food site	5.09	1.420	160

Correlations				
		Credibility rate- food web-blog	Topical knowledge_Fo od	Non-specific and Specific
Pearson Correlation	Credibility rate- food web-blog	1.000	-.132	.040
	Topical knowledge_Food	-.132	1.000	-.026
	Non-specific and Specific	.040	-.026	1.000
	Task difficulty - Food site	.128	.259	-.115
Sig. (1-tailed)	Credibility rate- food web-blog	.	.048	.307
	Topical knowledge_Food	.048	.	.370
	Non-specific and Specific	.307	.370	.
	Task difficulty - Food site	.053	.000	.074
N	Credibility rate- food web-blog	160	160	160
	Topical knowledge_Food	160	160	160
	Non-specific and Specific	160	160	160
	Task difficulty - Food site	160	160	160

Correlations		
	Task difficulty - Food site	
Pearson Correlation	Credibility rate- food web-blog	.128
	Topical knowledge_Food	.259
	Non-specific and Specific	-.115

Sig. (1-tailed)	Task difficulty - Food site	1.000
	Credibility rate- food web-blog	.053
	Topical knowledge_Food	.000
	Non-specific and Specific	.074
N	Task difficulty - Food site	.
	Credibility rate- food web-blog	160
	Topical knowledge_Food	160
	Non-specific and Specific	160
	Task difficulty - Food site	160

Model Summary ^c						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	
					R Square Change	F Change
1	.132 ^a	.017	.011	1.400	.017	2.792
2	.221 ^b	.049	.030	1.386	.031	2.569

Model Summary ^c			
Model	df1	Change Statistics	
		df2	Sig. F Change
1	1	158	.097
2	2	156	.080

a. Predictors: (Constant), Topical knowledge_Food

b. Predictors: (Constant), Topical knowledge_Food, Non-specific and Specific, Task difficulty - Food site

c. Dependent Variable: Credibility rate- food web-blog

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.469	1	5.469	2.792	.097 ^b
	Residual	309.475	158	1.959		
	Total	314.944	159			
2	Regression	15.336	3	5.112	2.662	.050 ^c
	Residual	299.607	156	1.921		
	Total	314.944	159			

a. Dependent Variable: Credibility rate- food web-blog

b. Predictors: (Constant), Topical knowledge_Food

c. Predictors: (Constant), Topical knowledge_Food, Non-specific and Specific, Task difficulty - Food site

Appendix N_ Regression_Travel

Topical knowledge > task difficulty, task type > Travel website evaluation

Regression

Descriptive Statistics			
	Mean	Std. Deviation	N
Credibility rate - travel web	5.02	1.662	160
Topical knowledge_Travel	1.24	.431	160
Non-specific and Specific	1.50	.502	160
Task difficulty - Travel site	4.86	1.396	160

Correlations				
		Credibility rate - travel web	Topical knowledge_Trav el	Non- specific and Specific
Pearson Correlation	Credibility rate - travel web	1.000	-.077	.019
	Topical knowledge_Travel	-.077	1.000	-.160
	Non-specific and Specific	.019	-.160	1.000
	Task difficulty - Travel site	.121	.090	-.013
Sig. (1-tailed)	Credibility rate - travel web	.	.167	.406
	Topical knowledge_Travel	.167	.	.022
	Non-specific and Specific	.406	.022	.
	Task difficulty - Travel site	.065	.129	.433
N	Credibility rate - travel web	160	160	160
	Topical knowledge_Travel	160	160	160
	Non-specific and Specific	160	160	160
	Task difficulty - Travel site	160	160	160

Correlations		
		Task difficulty - Travel site
Pearson Correlation	Credibility rate - travel web	.121
	Topical knowledge_Travel	.090
	Non-specific and Specific	-.013
	Task difficulty - Travel site	1.000
Sig. (1-tailed)	Credibility rate - travel web	.065

N	Topical knowledge_Travel	.129
	Non-specific and Specific	.433
	Task difficulty - Travel site	.
	Credibility rate - travel web	160
	Topical knowledge_Travel	160
	Non-specific and Specific	160
	Task difficulty - Travel site	160

Model Summary ^c						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	
					R Square Change	F Change
1	.077 ^a	.006	.000	1.662	.006	.936
2	.149 ^b	.022	.003	1.659	.016	1.309

Model Summary ^c			
Model	df1	Change Statistics	
		df2	Sig. F Change
1	1	158	.335
2	2	156	.273

a. Predictors: (Constant), Topical knowledge_Travel

b. Predictors: (Constant), Topical knowledge_Travel, Task difficulty - Travel site, Non-specific and Specific

c. Dependent Variable: Credibility rate - travel web

ANOVA ^a					
Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.585	1	2.585	.936
	Residual	436.359	158	2.762	
	Total	438.944	159		
2	Regression	9.788	3	3.263	1.186
	Residual	429.155	156	2.751	
	Total	438.944	159		

a. Dependent Variable: Credibility rate - travel web

b. Predictors: (Constant), Topical knowledge_Travel

c. Predictors: (Constant), Topical knowledge_Travel, Task difficulty - Travel site, Non-specific and Specific

Appendix O

Sobel test for topical knowledge (predictor), task difficulty (mediator) and credibility evaluation (dependent variable)

Sobel Test Calculator

Sobel Test – Topical knowledge, task difficulty and credibility evaluation – **Food website**

Calculate interactive Mediation Tests

Association between IV & mediator Coefficient (A)

Association between mediator & DV (B)

Standard error of A (S_a)

Standard error of B (S_b)

[Reset](#)

Test Name	Test statistic	P value
Sobel Test	6.72095	0.00

Sobel Test – Topical knowledge, task difficulty and credibility evaluation – **Travel website**

interactive Mediation Tests

Association between IV & mediator Coefficient (A)

Association between mediator & DV (B)

Standard error of A (S_a)

Standard error of B (S_b)

Test Name	Test statistic	P value
Sobel Test	7.94743	0.00

APPENDIX P (i) _ Topical Knowledge, Task Type, Credibility_Food website

Univariate Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: **Credibility rate- food web-blog**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	41.507 ^a	25	1.660	.814	.719	.132
Intercept	773.184	1	773.184	378.905	.000	.739
TopicKnowledge_Food	9.647	1	9.647	4.728	.031	.034
DiffFood	11.611	6	1.935	.948	.463	.041
TaskType	4.929	1	4.929	2.416	.122	.018
TopicKnowledge_Food * DiffFood	2.323	5	.465	.228	.950	.008
TopicKnowledge_Food * TaskType	.592	1	.592	.290	.591	.002
DiffFood * TaskType	5.662	5	1.132	.555	.734	.020
TopicKnowledge_Food * DiffFood * TaskType	3.853	5	.771	.378	.863	.014
Error	273.437	134	2.041			
Total	2899.000	160				
Corrected Total	314.944	159				

a. R Squared = .132 (Adjusted R Squared = -.030)

APPENDIX P (ii) _ Topical Knowledge, Task Type, Credibility_Travel website

Univariate Analysis of Variance

Topical Knowledge, Task Type, Credibility_Travel website

Tests of Between-Subjects Effects

Dependent Variable: Credibility rate - travel web

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	66.407 ^a	23	2.887	1.054	.405	.151
Intercept	1069.863	1	1069.863	390.569	.000	.742
TaskType	.593	1	.593	.217	.642	.002
TopicKnowledge_ITravel	4.770	1	4.770	1.741	.189	.013
DiffTravel	33.637	6	5.606	2.047	.064	.083
TaskType * TopicKnowledge_ITravel	.004	1	.004	.001	.971	.000
TaskType * DiffTravel	18.430	5	3.686	1.346	.249	.047
TopicKnowledge_ITravel * DiffTravel	7.694	5	1.539	.562	.729	.020
TaskType * TopicKnowledge_ITravel * DiffTravel	11.657	4	2.914	1.064	.377	.030
Error	372.537	136	2.739			
Total	4469.000	160				
Corrected Total	438.944	159				

a. R Squared = .151 (Adjusted R Squared = .008)

APPENDIX P (ii) cont'd

– ANOVA Post-Hoc Test Food and Travel_Credibility evaluations

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Credibility- food web-blog	13.903 ^a	3	4.634	2.402	.070	.044
	Credibility - travel web	13.800 ^b	3	4.600	1.688	.172	.031
Intercept	Credibility- food web-blog	1745.839	1	1745.839	904.698	.000	.853
	Credibility - travel web	2804.656	1	2804.656	1029.125	.000	.868
Topicknowledge_	Credibility- food web	7.121	1	7.121	3.690	.057	.023
Food	Credibility - travel web	.870	1	.870	.319	.573	.002
Topicknowledge_Travel	Credibility- food web	8.248	1	8.248	4.274	.040	.027
	Credibility - travel web	5.267	1	5.267	1.933	.166	.012
Topicknowlege_	Credibility- food web	.015	1	.015	.008	.929	.000
Food * Topicknowlege_Travel	Credibility - travel web	6.263	1	6.263	2.298	.132	.015
Error	Credibility- food web-blog	301.041	156	1.930			
	Credibility - travel web	425.144	156	2.725			
Total	Credibility- food web-blog	2899.000	160				
	Credibility - travel web	4469.000	160				
Corrected Total	Credibility- food web-blog	314.944	159				
	Credibility - travel web	438.944	159				

a. R Squared = .044 (Adjusted R Squared = .026)