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Design Guidelines for Online Resources: A Longitudinal Analysis of Information Processing

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Design Guidelines for Online Resources: A Longitudinal Analysis of Information Processing

Abstract

This paper proposes that to create superior information resources that meet the information needs of the target audience, a greater understanding of information processing is required. We suggest that the subjective assessment criteria that information-seekers use to process information resources and the information they contain can be used to produce design guidelines for online information resources. This is tested using data from a participant in an eighteen-month longitudinal study of expectant and new mothers. From our participant, three information resource assessment criteria (convenience, credibility, and format) and five information assessment criteria (complete, easy to understand, references, relevance and reliability) were identified. These eight criteria were used to generate design guidelines to meet the needs of our participant. This article provides an analysis tool that can be used by other researchers to collect and analyse subjective assessment criteria.

Keywords: information processing; information use; longitudinal; information behaviour; subjective assessment criteria; design guidelines;

Introduction

To design an effective online resource, it is essential to understand the information behaviour of the target audience (Zhang, Wang, Heaton, & Winkler, 2012). Information behaviour includes '*those activities a person may engage in when identifying his or her own need for information, searching for such information in any way, and using or transferring that information'* (Wilson, 1999, p.249). This paper uses data from a longitudinal study of the information behaviour of expectant and new mothers to explore an area of information behaviour that has received insufficient attention, namely information use (Case & O'Connor, 2015).

This paper posits that a more accurate term for information use is information processing and use. This is because it covers the processing of information and the internal and behavioural use of that information, Figure 1. This paper focuses on the first phase of information processing and use, information processing. The aim of information processing is to determine if the information found during information-seeking resolves the information needs which prompted the search (Wilson, 1981). This research examines how information seekers use subjective assessment criteria to process different information resources and the information they contain. The central thesis of this study posits that by identifying the subjective assessment criteria used by a target population during information processing, design guidelines can be created for online information resources.

It has been proposed that pregnancy and parenting '*are extremely rich contexts in which to study information-seeking practices*' (McKenzie, 2004, p. 686). This paper provides a longitudinal analysis of the information processing of a first-time mother. This analysis, which includes data from seven semi-structured interviews and activity diaries, is conducted over approximately eighteen months. The analysis is used to offer new insights into information processing, and to produce design guidelines for an online resource.

The remainder of the paper is structured as follows: the next section discusses the literature on information processing and use. The methodology section provides an overview of the wider longitudinal study before providing insight into the participant selected for inclusion in this paper. The findings section discusses the subjective assessment criteria for one study participant. The paper concludes with a discussion of the value of subjective assessment criteria and an example of design guidelines that can be derived.

Defining Information Processing and Use

Researchers have repeatedly highlighted the ambiguity surrounding information use (Bawden

& Robinson, 2012; Case & O'Connor, 2015; Niemelä, Huotari, & Kortelainen, 2012). It is an area that has been frequently referenced but is rarely explicated (Savolainen, 2009b). Instead, it is left as an ambiguous appendix to information-seeking (ibid). It is perhaps unsurprising then that researchers have also highlighted the lack of empirical investigation into information use (Niemelä et al., 2012; Tuominen & Savolainen, 1997), particularly when compared to other areas within information behaviour, such as information needs and seeking (Case & O'Connor, 2015).

One of the difficulties for researchers lies in the inconsistent and interchangeable use of terminology (Kari, 2010; Savolainen, 2009a). The terms used include information use, information processing, knowledge utilisation, information utilisation, information use behaviour and information use outcome (Choo, Bergeron, Detlor, & Heaton, 2008; Spink & Currier, 2006; Todd, 1999). Several attempts at categorising definitions exist, including Kirk (2002) and Kari (2010). However, Savolainen (2006) provides the most concise during his discussion on sensemaking. He suggests that there are basically '*two major viewpoints: (a) information use as a process, and (b) the various outcomes of this process*' (2006, p.1120). From this perspective, we suggest that information processing and use is a better and more inclusive term than information use. Information processing and use allows for two phases, the first where information is processed by the information-seeker and the second where the processed information is utilised by the seeker, Figure 1.

Figure 1. Information Processing and Use

Information Processing

The first phase of information processing and use is information processing, Figure 1. Within information processing, there are two stages, (1) evaluation, and (2) comparison. Evaluation examines individual information resources and the information that they contain, whereas comparison looks at groups of information resources. The aim of this phase is to discover if the information found satisfies the seeker's information need (Wilson, 1981).

During the comparison stage of information processing, information-seekers may compare information from multiple resources as a method of verification (Ellis, 1993; Watson, 2014). Information-seekers may also choose to combine the information into one 'information product' (Foster, 2004; Watson, 2014). This stage can involve both external information resources and internal cues, such as relevant prior beliefs or past experiences (Wood, Kallgren, & Preisler, 1985). When comparing resources information-seekers can be biased by factors such as confirmation bias or search engine ranking (R. White, 2013).

Research has highlighted issues related to the increasing quantity of information available online and its variable quality (Kim, Park, & Bozeman, 2011; Sillence, Briggs, Harris, & Fishwick, 2007). Although many instruments exist for rating the quality of eHealth resources, it has been suggested that they may not be practical for information-seekers to use (Bernstam, Shelton, Walji, & Meric-Bernstam, 2005) and are not effective at highlighting inaccurate information (Bernstam et al., 2008). In order to offer new insights, this paper focuses on the subjective assessment criteria that the information-seeker uses to evaluate and compare different information resources, and the information they contain. This allows us to produce design guidelines based on the information-seekers actual behaviour and preferences.

Information Use

The second phase of information processing and use is information use, Figure 1. Information use can be internal and/or behavioural (Kari, 2007). Behavioural information use involves observable physical actions such as a change in the information-seeker's behaviour or the sharing of information. Behavioural use is similar to what Niemelä et al. (2012) term enactment.

Internal information use includes any cognitive or affective changes within the information-seeker (Dervin, 1999). Information-seeking can result in both positive or negative affective impact on the information-seeker (R. W. White & Horvitz, 2009). As these changes occur within the information-seeker's mind they are not directly observable (Spink & Cole, 2006); therefore, researchers rely on information-seekers to explicitly state any cognitive or affective changes they experience. However, inputs, such as information resources accessed and outputs, such as behavioural information use are observable (Spink & Cole, 2006). These inputs and outputs may allow the researcher to make inferences into the cognitive and affective changes that have occurred.

Methodology

This study is part of a larger exploratory longitudinal study into the information behaviour of expectant and new mothers. Longitudinal studies enable an in-depth understanding of the interaction between variables and how their relationships change over time (Jurison, 1996). However, they are relatively rare in mainstream IS (information systems) and particularly in information behaviour studies (cf. Anker, Reinhart, & Feeley, 2011; Jurison, 1996).

Considering the longitudinal nature of the study, the case study approach was deemed appropriate because it is suited to situations where it is difficult to remove the context from the subject being investigated (Yin, 2003). Data was collected using a mix of semi-structured

interviews and activity diaries. Semi-structured interviews provide the opportunity to collect detailed evidence while also leaving flexibility to encourage participants to add additional information they might think is important (Remenyi & Williams, 1995). The interviews were scheduled at approximately three-month intervals, meaning that each participant was to be interviewed seven times by the end of the study. An interview guide is provided in Appendix A. The activity diaries were used by participants to record the frequency and type of information behaviour over the duration of the study. The participants gathered information on topics they researched. They also recorded and rated information resources that they accessed. A sample activity diary for the participant is included in Appendix B.

The study started with twelve participants. Attrition is a known complication of longitudinal studies (Ruspini, 1999). Data from those participants that completed four or more interviews was included in the study. This provided coverage for both the antenatal and postnatal periods. As a result, the study concluded with nine participants, seven of whom completed the full seven interviews, Table 1. By observing the participants during both the antenatal and postnatal period, it afforded us the opportunity to note changes in participant information behaviour, including the factors that influenced those changes.

PNum	**Interview Number**							**Weeks in Study**
	Antenatal		*Postnatal*					
	1	*2*	*3*	*4*	*5*	*6*	*7*	
P14	X	X	X	X	X	X	X	94
P7	X	X	X	X	X	X	X	91
P4	X	X	X	X	X	X	X	88
P18	X	X	X	X	X	X	X	85
P5	X	X	X	X	X	X	X	84
P8	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**80**
P10	X	X	X	X	X	X	X	74
P12	X	X	X	X	X	-	-	67
P1	X	X	X	X	-	-	-	38
P16	X	X	X	-	-	-	-	16
P11	X	-	-	-	-	-	-	-
P19	X	-	-	-	-	-	-	-

Table 1. Longitudinal Data Collection across all Study Participants

Participant Eight (P8)

This paper focuses on a single participant (P8), Table 1. P8 completed all seven interviews. An overview of the characteristics of P8 is provided in Table 2. These are provided to provide insight into P8. Characteristics of the seeker have been shown to impact on individuals information behaviour (Wilson, 1997). As such, Table 2 demonstrates areas of information behaviour that were influenced by P8's characteristics. For example, P8's work as a special needs assistant influenced the creations of tasks and the evaluation of information and resources. P8 also used the experience she gained in work as an extra information resource, comparing it to other information resources

Area of Information Behaviour	**Characteristics of the Seeker (P8)**				
	First-time mother	*> 35*	*In a relationship*	*Has master's degree*	*Worked as a special needs assistant*
Tasks	Wanted a second child, in the postnatal period researched factors influencing fertility.			Had an interest in childhood development and parenting strategy as a result of her masters and work experience.	
Information-Seeking			Her partner searched for information on her behalf (proxy search).		
Information Processing			Her partner influenced her opinion of online discussion forums.	Helped her to evaluate information resources & information.	Altered how she evaluated information resources when she returned to work after maternity leave – limited time/availability of resources.
					Compared information she found against experience gained in work.

Table 2. Examples of How Characteristics of the Seeker Influence Information Behaviour

Coding the Data

This study examines P8's subjective assessment criteria for information resources. Information resources have previously been classified in several different ways including traditional/non-traditional (Gray, Klein, Noyce, Sesselberg, & Cantrill, 2005) and subjective/objective (Cooley & Madupu, 2009). Personal, online and print resources are common categories across several different classifications (Bronstein, 2010; Lee, Paik, & Joo, 2012; Pálsdóttir, 2008; Rieh & Danielson, 2007; Savolainen, 2010). All personal resources are sometimes included in one category (Bronstein, 2010; Lee et al., 2012) while other classifications separate expert resources into a separate category (Pálsdóttir, 2008; Savolainen, 2010). Similarly, mass media has been included in the same category as print resources (Pálsdóttir, 2008) and has also been separated into its own category (Lee et al., 2012; Rieh, 2007). The information resources in this study are classified under five headings, Figure 2.

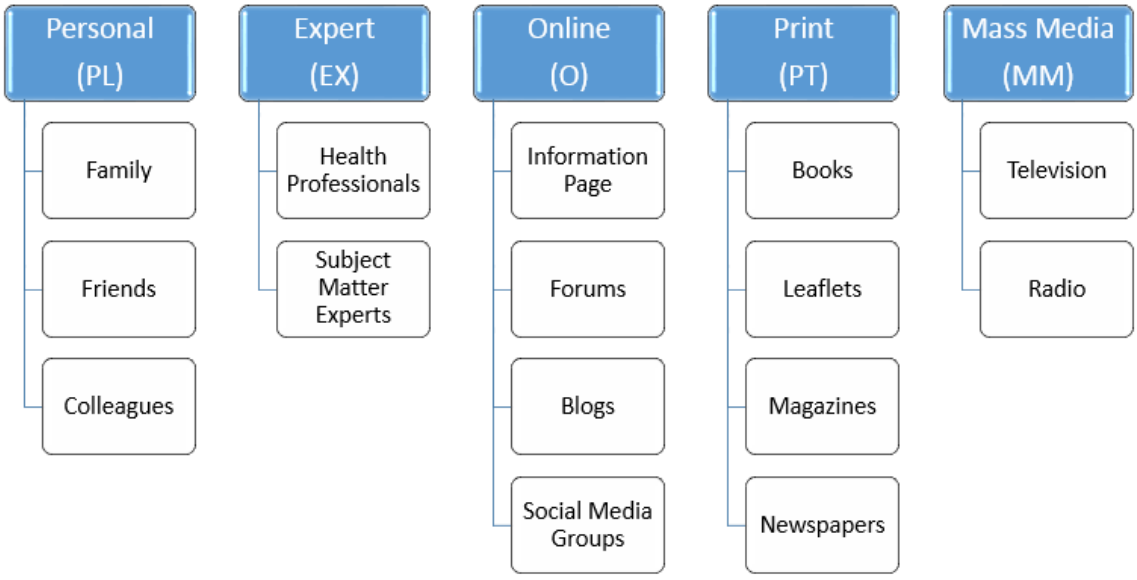

Figure 2. Information Resources Categories

The next step in coding the data was to build a tool to examine the subjective criteria across all the information resource categories. Table 3 includes all five information resource

categories and examines the subjective assessment criteria for both information resources and information.

		Information Resource					Illustrative Quotes
		PL	*EX*	*O*	*PT*	*MM*	
Information Resource Criteria	1						
	2						
	3						
Information Criteria	1						
	2						
	3						
Key: Personal (PL), Expert (EX), Online (O), Print (PT), Mass Media (MM)							

Table 3. Subjective Assessment Criteria Analysis Tool

Findings

This section examines the subjective assessment criteria used by participant (P8) to process information resources and the information contained within these resources. Each criterion is discussed individually using illustrative examples, to emphasise criteria that could be developed into design guidelines. Many of the quotes used in Table 4 relate to online resources as they were one of P8's primary information resources. While this is useful for the development of design guidelines for online resources, useful insight can also be gained from P8's evaluation of other resource categories. The lack of quotes referencing multimedia is reflective of the fact that P8 rarely reported accessing multimedia resources.

P8 viewed online and personal resources as **convenient** sources of information. Online resources were convenient because they were readily available at any time. Personal resources and the Babycentre newsletter were convenient because they brought information to her, without her having to actively seek it. P8 found that interesting topics could naturally come up in conversation when she spoke to people, Table 4. The newsletter was emailed weekly until the child was a year old. The weekly frequency suited P8 until she returned to

work, because she then had less time. It would have suited P8's needs if the newsletter had changed to monthly earlier.

		Information Resource					Quotes
		PL	*EX*	*O*	*PT*	*MM*	
Information Resource Criteria	**Convenience**			X			*'Yeah, [the newsletter] comes and I always look at it. I find it actually very convenient.'*
				X			*'For the health stuff, I would look a lot at the internet because it's easier. It's just accessible anytime.'*
		X					*'I suppose I would talk to people more about general information because it comes up in conversation as well.'*
	Credibility			X	X		*'Obviously, I prefer if I recognise who wrote it, I would even Google the name of the author though I don't tend to do that with websites that much. It's mostly with books that I would Google the authors.'*
				X			*'I highly recommend it for parents; it's called the Alpha Parent. It's written by a woman, a mother who has a lot of qualifications in childcare as well.'*
				X			*'People write anything in forums you can't really trust them.'*
		X					*'I would listen to my sister if she told me something. But that's the thing; I would listen to my sister because I trust my sister.'*
		X					*'I spoke to first friends, people who had experience.'*
	Format			X			*'Some websites look like really bad websites. Now having said that there might be good articles in sites like that, but overall I think aesthetically when a site is full of ads or flashing ads or things like that it can be a bit dodgy.'*
Information Criteria	**Complete**				X		*'But they were not actually telling you what to do, and you didn't realise this until you had read the book until the very end. So I think that book put me off other books a little bit.'*
			X	X	X		*'I believe in covering the worst case scenario as thoroughly as you can when you give information on topics like that, labour, breastfeeding, etc. Anything that can go wrong. I would like it to be covered.'*
	Easy to understand			X			*'Well for me it depends on how it is written, and what they say because people tend to exaggerate sometimes.'*
				X	X		*'The language is definitely important, I mean how well written something is.'*
			X				*'They communicated all this information very clearly. I found them in the labour ward amazing.'*
	References			X			*'The Alpha Parent Blog has a lot of links to articles because [the author] is doing the research in a scientific way.'*
				X			*'I suppose a good site for me is a site that has links to the references where they get their own information from. So, you can then deepen the research more and more yourself.'*
	Relevance			X			*'There was nothing about Ireland obviously and what happens here.'*
				X			*'They are very relevant because [my child] seems to be like a textbook baby in terms of the age that she seems to be doing things.'*
	Reliability			X			*'In the first page usually of results you get the basic sites that would maybe be a bit more reliable.'*
				X			*'I suppose usually the place I always start and I still do, is BabyCentre. I think it is an amazing site, a very reliable site and a general site. I just Google the search words plus BabyCentre UK.'*
Key: Personal (PL), Expert (EX), Online (O), Print (PT), Mass Media (MM)							

Table 4. Subjective Assessment Criteria

P8 determined the **credibility** of print resources based on the expertise of the author, Table 4. Although P8 stated that she did not regularly research the expertise of the producers of website content, P8 did find the Alpha Parent blog more credible because it listed the author's qualifications and personal experience as a mother. P8 spent much of the study wary of the information provided on online discussion forums; part of the reason for this was the fact that she could not authenticate who produced the information. Trust is an important factor within credibility judgements; from Table 4 it is evident that P8 trusted the advice of her sister. This was also the case with her partner, whom P8 relied on to search for information for her, to act as a proxy searcher.

For P8, personal experience in a particular area was something that gave the resource credibility. However, P8 often liked to access both personal experience and fact-based medical resources together, that way she could verify the information from two different angles. For example, during the antenatal period, P8 accessed personal resources along with online medical studies to verify information on co-sleeping she had found in a book. The personal resources gave her insight into the experiences of parents, whereas the medical information explained information on stress hormones.

When P8 negatively evaluated the **format** of an information resource, she tended to reject the resource before evaluating the information. On the other hand, effective use of multimedia such as images and video has aided P8 to process information. For example, P8 compared different images of tumours to help her conceptualise her own. P8 was waiting on the results of a scan to discover if her tumour had shrunk; she found looking online at the size of different tumours reassuring because there was *'no way in hell [she] could have one of these inside [her]*.' P8 recounted how she selected a book solely based on the format of the book. This book on infant weaning was a publication that P8 would have typically overlooked, due to a conflict in parenting approach, however she found the outlines and the

chapter summaries appealing. Subsequently, she incorporated this publication into her weaning strategy

P8 preferred to have a **complete** picture, to have all the information, including the worst case scenario, Table 4. P8 found that it made it easier to make a decision. During the postnatal period, P8 had to decide between the conflicting advice from her GP and a lactation consultant. In the end, P8 choose a hybrid of the two solutions. This resulted in medical complications. Several months later, P8 found a medical article online which explained the lactation consultant's advice in further detail, including the biological processes involved. P8 felt frustrated because she would have paid greater attention to the lactation consultant's advice if it had been explained to her in those terms.

P8 discussed the importance of language and communication for expert, online and print resources, Table 4. It was important to P8 that information was **easy to understand**. The quality of the writing influenced P8's judgement of the quality and credibility of the message. Although there were some complications during P8's delivery, she found that the medical professionals ensured that they clearly communicated everything that was happening. This helped to reassure P8.

The importance and usefulness of **references** was something P8 discussed on a number of occasions during the study. P8 considered references in a website to be a sign of quality information that was produced from scientific research, Table 4. P8 also stated that her ideal online resource would include references that would allow her to continue to further her own research.

There are two types of **relevance** in Table 4, relevance to the task/situation and relevance to the location. Relevance to the task refers to evaluating information against the task that prompted the search. The task can evolve as the search continues and new information is found. The other type of relevance included in Table 4 is relevance to the

location. This type of relevance relates to finding information specific to your country or local area i.e. localised information.

P8 was not specific about how she determined **reliability**; however**,** P8 did state that reliable online resources were often if not always found on the first page of the Google search results Table 4. As P8 became more familiar with the information resources available for expectant and new mother, she became more confident in her ability to evaluate online resource reliability. She stated that '*they are quite standard at this age, and I have found the ones that are okay, you definitely feel okay, that's quite reliable.'*

In the next section we review the design guidelines developed from P8's subjective assessment criteria. This includes the three information resource assessment criteria (convenience, credibility, and format) and the five information assessment criteria (complete, easy to understand, references, relevance, and reliability).

Discussion

After a review of the subjective assessment criteria used by P8 during information processing a list of design, guidelines were produced Table 5. In this case, the design guidelines are based on the information needs of one individual. However, we propose that if the Subjective Assessment Criteria Analysis Tool was used to collect data from a larger sample group, then design guidelines could be produced to meet the information needs of that group.

The design guidelines in Table 5 are divided by information resource and information. They are based on the criteria identified in the previous section. Each guideline attempts to highlight a feature that P8 valued or to address an issue that P8 identified. The information resource assessment criteria we identified were convenience, credibility, and format. The email newsletter is a good illustrative example of how information resource design guidelines were created. P8 found that the email newsletter was convenient until she returned to work,

and became convenient again when the frequency dropped to monthly when the child turned one. It would have been beneficial if she could have adjusted the frequency herself.

Type	Criteria	Design Guideline
Information Resource	Convenience	Site should be accessible on a wide range of devices.
		Allow users to change the frequency of push content.
	Credibility	Clearly display the credentials of contributors to the site.
		Display any personal experience contributors have.
	Format	Consider the size, number and placement of multimedia.
		The appropriate use of multimedia can be used to enhance a user's understanding of a topic.
		Use outlines and summaries to provide an overview of topics.
Information	Complete	Topics should be covered in as much detail as possible.
		Include a mix of personal stories and expert opinions.
	Easy to Understand	Provide clear, concise information.
	References	Clearly display references for sources.
		Provide references for users who wish to do additional research on a topic.
	Relevance	Localise information for different regions.
	Reliability	Optimise website design to improve search engine rankings.

Table 5. Design Guidelines

The information assessment criteria we identified were complete, easy to understand, references, relevance and reliability, Table 5. An illustrative example from the information design guidelines is the mix of personal and expert opinions included under the complete section, Table 5. P8 regularly compared both types of information because while she considered them both credible, they gave her different kinds of viewpoints. If an information resource provided both types of information, then it would be a more complete resource.

The number of different information resources categories where P8 referenced a criterion may indicate its importance and, therefore, the importance of the associated design guidelines. As such it should be noted that credibility, complete and easy to understand were all referenced by P8 in three out of five of the information resource categories, more than any other criterion.

Conclusion

Information use is an important part of information behaviour. However, there has been a lack of both conceptual clarity and empirical research into the area (Bawden & Robinson, 2012; Case & O'Connor, 2015; Niemelä et al., 2012). This paper brings greater conceptual clarity to the area by proposing that information processing and use is a more accurate term than information use, as it covers both the processing of the information and the internal and behavioural use of the processed information, Figure 3.

Figure 3. Information Processing and Use

Next, this article demonstrates a tool and a series of steps that could be used to address the lack of empirical investigation into information processing, the first phase of information processing and use. We proposed a Subjective Assessment Criteria Analysis Tool, Table 3, for the collection and analysis of subjective assessment criteria. We used the example of a single participant in an exploratory longitudinal study to show that these criteria can be harnessed to create design guidelines for online information resources. Fourteen design guidelines were produced for P8, our example participant. The guidelines were based on three information resource criteria (convenience, credibility, and format) and five information criteria (complete, easy to understand, references, relevance, and reliability)

This research uses subjective assessment criteria during information processing to assess information resources and the information contained within. Further investigation is required to understand the impact that those criteria may have on the second phase of information processing and use, information use. We also recognise the influence of other

factors on information needs, such as characteristics of the seeker, which we discussed in the methodology section. However, we suggest that if the information processing of a larger population were analysed specifically the subjective assessment criteria, design guidelines could be produced to meet their information needs.

References

Anker, A. E., Reinhart, A. M., & Feeley, T. H. (2011). Health information seeking: a review of measures and methods. *Patient education and counseling, 82*(3), 346-354. doi: 10.1016/j.pec.2010.12.008

Bawden, D., & Robinson, L. (2012). *An Introduction to Information Science*. London: Facet Publishing.

Bernstam, E. V., Shelton, D. M., Walji, M., & Meric-Bernstam, F. (2005). Instruments to assess the quality of health information on the World Wide Web: what can our patients actually use? *International Journal of Medical Informatics, 74*(1), 13-19. doi: http://dx.doi.org/10.1016/j.ijmedinf.2004.10.001

Bernstam, E. V., Walji, M. F., Sagaram, S., Sagaram, D., Johnson, C. W., & Meric-Bernstam, F. (2008). Commonly cited website quality criteria are not effective at identifying inaccurate online information about breast cancer. *Cancer, 112*(6), 1206-1213. doi: 10.1002/cncr.23308

Bronstein, J. (2010). Selecting and using information sources: source preferences and information pathways of Israeli library and information science students. *Information Research, 15*(4), paper 447 [Available at http://InformationR.net/ir/415-444/paper447.html].

Case, D. O., & O'Connor, L. G. (2015). What's the use? Measuring the frequency of studies of information outcomes. *Journal of the Association for Information Science and Technology*, n/a-n/a. doi: 10.1002/asi.23411

Choo, C. W., Bergeron, P., Detlor, B., & Heaton, L. (2008). Information culture and information use: An exploratory study of three organizations. *Journal of the American Society for Information Science and Technology, 59*(5), 792-804.

Cooley, D. O., & Madupu, V. (2009). How did you find your physician?: An exploratory investigation into the types of information sources used to select physicians. *International Journal of Pharmaceutical and Healthcare Marketing, 3*(1), 46-58.

Dervin, B. (1999). On studying information seeking methodologically: the implications of connecting metatheory to method. *Information Processing & Management, 35*(6), 727-750. doi: http://dx.doi.org/10.1016/S0306-4573(99)00023-0

Ellis, D. (1993). Modeling the information-seeking patterns of academic researchers: A grounded theory approach. *The Library Quarterly, 63*(4), 469-486.

Foster, A. (2004). A nonlinear model of information-seeking behavior. *Journal of the American Society for Information Science and Technology, 55*(3), 228-237. doi: 10.1002/asi.10359

Gray, N. J., Klein, J. D., Noyce, P. R., Sesselberg, T. S., & Cantrill, J. A. (2005). Health information-seeking behaviour in adolescence: the place of the internet. *Social Science & Medicine, 60*(7), 1467-1478.

Jurison, J. (1996). The temporal nature of IS benefits: A longitudinal study. *Information & Management, 30*(2), 75-79. doi: http://dx.doi.org/10.1016/0378-7206(95)00050-X

Kari, J. (2007). Conceptualizing the personal outcomes of information. *Information Research, 12*(2), paper 292 [Available at http://InformationR.net/ir/212-292/paper292.html].
Kari, J. (2010). Diversity in the conceptions of information use. *Information Research, 15*(3), colis709 [Available at http://InformationR.net/ir/715-713/colis707/colis709.html].
Kim, H., Park, S.-Y., & Bozeman, I. (2011). Online health information search and evaluation: observations and semi-structured interviews with college students and maternal health experts. *Health Information & Libraries Journal, 28*(3), 188-199. doi: 10.1111/j.1471-1842.2011.00948.x
Kirk, J. (2002). *Theorising information use: Managers and their work*. Doctoral Dissertation. University of Technology, Sydney, Australia. Retrieved from http://epress.lib.uts.edu.au/dspace/bitstream/handle/2100/309/02whole.pdf?sequence=2.
Lee, J. Y., Paik, W., & Joo, S. (2012). Information resource selection of undergraduate students in academic search tasks. *Information Research, 17*(1 [Available at http://InformationR.net/ir/17-1/paper511.html]).
McKenzie, P. J. (2004). Positioning theory and the negotiation of information needs in a clinical midwifery setting. *Journal of the American Society for Information Science and Technology, 55*(8), 685-694. doi: 10.1002/asi.20002
Niemelä, R., Huotari, M.-L., & Kortelainen, T. (2012). Enactment and use of information and the media among older adults. *Library & Information Science Research, 34*(3), 212-219. doi: http://dx.doi.org/10.1016/j.lisr.2011.12.002
Pálsdóttir, Á. (2008). Information behaviour, health self-efficacy beliefs and health behaviour in Icelanders' everyday life. *Information Research, 13*(1), paper 334. [Available at http://InformationR.net/ir/313-331/paper334.html].
Remenyi, D., & Williams, B. (1995). Some aspects of methodology for research in information systems. *Journal of Information Technology, 10*(3), 191-201.
Rieh, S. Y. (2007). Toward an integrated framework of information and communication behavior: College students' information resources and media selection. *Proceedings of the American Society for Information Science and Technology, 44*(1), 1-15.
Rieh, S. Y., & Danielson, D. R. (2007). Credibility: A multidisciplinary framework. *Annual Review of Information Science and Technology, 41*(1), 307-364. doi: 10.1002/aris.2007.1440410114
Ruspini, E. (1999). Longitudinal research and the analysis of social change. *Quality and Quantity, 33*(3), 219-227.
Savolainen, R. (2006). Information use as gap-bridging: The viewpoint of sense-making methodology. *Journal of the American Society for Information Science and Technology, 57*(8), 1116-1125. doi: 10.1002/asi.20400
Savolainen, R. (2009a). Epistemic work and knowing in practice as conceptualizations of information use. *Information Research, 14*(1), paper 392 - http://InformationR.net/ir/314-391/paper392.html.
Savolainen, R. (2009b). Information use and information processing: Comparison of conceptualizations. *Journal of Documentation, 65*(2), 187-207.
Savolainen, R. (2010). Source preference criteria in the context of everyday projects: Relevance judgments made by prospective home buyers. *Journal of Documentation, 66*(1), 70-92.
Sillence, E., Briggs, P., Harris, P., & Fishwick, L. (2007). Going online for health advice: Changes in usage and trust practices over the last five years. *Interacting with Computers, 19*(3), 397-406. doi: http://dx.doi.org/10.1016/j.intcom.2006.10.002

Spink, A., & 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. doi: 10.1002/asi.20249

Spink, A., & Currier, J. (2006). Towards an evolutionary perspective for human information behavior: An exploratory study. *Journal of Documentation, 62*(2), 171-193. doi: doi:10.1108/00220410610653280

Todd, R. J. (1999). Back to our beginnings: information utilization, Bertram Brookes and the fundamental equation of information science. *Information Processing & Management, 35*(6), 851-870. doi: http://dx.doi.org/10.1016/S0306-4573(99)00030-8

Tuominen, K., & Savolainen, R. (1997). *A social constructionist approach to the study of information use as discursive action.* Paper presented at the Information Seeking in Context: Proceedings of the International Conference on Research in Information Needs, Seeking and Use in Different Contexts.

Watson, C. (2014). An exploratory study of secondary students' judgments of the relevance and reliability of information. *Journal of the Association for Information Science and Technology, 65*(7), 1385-1408. doi: 10.1002/asi.23067

White, R. (2013). *Beliefs and biases in web search*. Paper presented at the Proceedings of the 36th international ACM SIGIR conference on Research and development in information retrieval, Dublin, Ireland.

White, R. W., & Horvitz, E. (2009). Experiences with Web Search on Medical Concerns and Self Diagnosis. *AMIA Annual Symposium Proceedings, 2009*, 696-700.

Wilson, T. D. (1981). On user studies and information needs. *Journal of Documentation, 37*(1), 3-15. doi: 10.1108/eb026702

Wilson, T. D. (1997). Information Behaviour: An Interdisciplinary Perspective. *Information Processing & Management, 33*(4), 551-572.

Wilson, T. D. (1999). Models in information behaviour research. *Journal of Documentation, 55*(3), 249-270.

Wood, W., Kallgren, C. A., & Preisler, R. M. (1985). Access to attitude-relevant information in memory as a determinant of persuasion: The role of message attributes. *Journal of Experimental Social Psychology, 21*(1), 73-85.

Yin, R. K. (2003). *Applications of Case Study Research* (2nd Edition ed.): Sage.

Zhang, Y., Wang, P., Heaton, A., & Winkler, H. (2012). *Health information searching behavior in MedlinePlus and the impact of tasks.* Paper presented at the Proceedings of the 2nd ACM SIGHIT International Health Informatics Symposium.

Appendix A

Interview Guide

Topics to cover in every interview:

- Review the activity diary with the participant
- How has the participant's information-seeking changed since the last interview? (increase/decrease)
- Has the type of information you have been looking for changed?
- Have you found that you are getting your information from the same sources all the time, or has it changed?
- Did the participant alter their behaviour as a result of any information they found?
- Did the participant encounter any conflicting information?
- If encounter health professionals – is information sufficient?
- First Time Mother:
    - How are finding Pregnancy/Motherhood?
- Mother with children
    - Does this pregnancy differ from previous?
    - Has your information-seeking changed?

Topics to cover in the last interview:

- What were the busiest and quietest periods from the start of pregnancy to now, for information-seeking?
- What information resources did the participant find most useful at the different stages? (antenatal, postnatal)
- Were there different topics that the participant remembers being particular difficult to find information on?
- Was there any particular topic that the participant remembers spending a lot of time searching?
- Are there any features of online resources that the participant values?
- Are there are changes that the participant would like made to the online resources she uses?

Appendix B

Sample Activity Diary for P8

Week of Pregnancy	What information were you looking for?	Where did you get the information?	Time spent? a) >15min b) >30min c) >1hr d) <1hr	Information Search performed by: a) You b) Spouse/Partner c) You and Spouse/Partner d) Family Member e) Other (Please Specify)	Trust in source? a) High b) Med c) Low	Information Quality a) High b) Med c) Low	Have you used this source before? a) Yes b) No	Will you use this source again? a) Yes b) No
5-8	My pregnancy this week	Babycentre UK Newsletter	b)	a + b (Consistently)	a)	a)		a)
24-25	Info on gallstones/ gallbladder inflammation	Midwife/Mayo Clinic	a)	a)	b)	c)	b	a)
	"	2) Baby Center.com	a)	a)	a)	b)	a)	a)
		3) Drug.com	a)	a)	a)	a-b	a)	a)
		4) Mayo Clinic	b)	a)	a)	a)	a)	a)
		5) Web md.com						
		6) Ma. of Maryland Med. Centre	b)	a)	a)	a)	a)	a)
		7) Speakbyfeeches.com						
	Milk thistle & pregnancy	Drug.com	a)	a)	a)	a)	a)	a)
	Dandelion tea & pregnancy	"	b)	b)	b	b	b	b