PRELIMINARY RESEARCH OF INFORMATION OVERLOAD FROM INFORMATION SEARCH AND INFORMATION FOLLOW

BADANIE WSTĘPNE NAD PRZECIĄŻENIEM INFORMACYJNYM W WYNIKU WYSZUKIWANIA INFORMACJI ORAZ ŚLEDZENIA INFORMACJI

Tingting He, PhD
Governors State University, College of Business, Division of Management, Marketing and Entrepreneurship
1 University Pkwy, University Park, IL 60484, USA
the@govst.edu ● ORCID 0000-003-1679-9956

ABSTRACT

The major objective of this research is to test if two types of information overload are different: Information overload from searching for the information someone needs to search, and information overload from following all the information someone needs to follow. These two types of information overload may be labelled information search overload and information follow overload, corresponding to the concepts of information search and information follow. Using the data of a survey from a sample of about 1600 respondents across 50 states in the United States, the research identified 2 items corresponding to information search overload and information follow overload, and ran analyses including correlation and logistic regression with the 2 items separately as the dependent variables, and with some other items about consumers' activities involving information as independent variables. Results of the various analyses suggest that information search overload and information follow overload are different, especially in terms of how they associate with different variables of consumer activities involving information, therefore indicate as a preliminary research that we may separate the two types of information overload in our future research.

Key words: information, information overload, information search, information follow, preliminary research

ABSTRAKT

Głównym celem tego badania jest sprawdzenie, czy dwa rodzaje przeciążenia informacyjnego są różne: przeciążenie informacjami w wyniku wyszukiwania potrzebnych informacji i przeciążenie informacyjne wynikające ze śledzenia wszystkich informacji, które ktoś musi śledzić. Te dwa typy przeciążenia informacyjnego są nazywane „przeciążenie informacją wyszukiwaną" i „przeciążenie informacją śledzoną", co odpowiada pojęciom wyszukiwania informacji i śledzenia informacji. Posługując się danymi z ankiety przeprowadzonej na próbie 1600 respondentów z 50 stanów w Stanach Zjednoczonych, w badaniu zidentyfikowano dwie pozycje odnoszące się do przeciążenia informacją wyszukiwaną oraz przeciążenia informacją śledzoną i przeprowadzono analizę uwzględniającą korelację i regresję logistyczną z obydwiema pozycjami oddzielnie jako zmiennymi zależnymi, a także innymi pozycjami dotyczącymi działań konsumentów, uwzględniając informacje jako niezależne zmienne. Wyniki różnych analiz sugerują, że przeciążenie informacją wyszukiwaną i przeciążenie informacją śledzoną są odmienne, szczególnie pod względem sposobu, w jaki wiążą się z różnymi zmiennymi działań konsumenckich dotyczących informacji, dlatego też jako badanie wstępne wskazują, że możemy odseparować dwa rodzaje przeciążenia informacyjnego w naszych przyszłych badaniach.

Słowa kluczowe: informacja, przeciążenie informacyjne, wyszukiwana informacja, śledzona informacja, badanie wstępne

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Introduction

Information overload is a phrase that often appears in academic literature (e.g. Roetzel, 2019; Eppler and Mengis, 2004) and news media (e.g. Baranetsky, 2017; Dean and Webb, 2011; Hemp, 2009) in our information age. Due to the Pew Research Center (Horrigan, 2016a), about 20% of the population in the U.S. feel overloaded by information. Due to the Harvard Business Review (Hemp, 2009), information overload is not only about the large amount of information we need to search, but also about the incoming information that we need to follow. Intuitively, regarding information overload, there may be too much information from searching all sorts of information, while there may be too much information from following large volume of information. However, while lots of research has

been dedicated to information overload (e.g. Roetzel, 2019; Melinat, Kreuzkam, and Stamer, 2014; Eppler and Mengis, 2004), there has rarely been any research differentiating between information overload from searching information and information overload from following information. Searching and following information both seem to contribute to information overload, while both are so common that rarely do people compare them or their different impacts on consumer behavior. For simplicity, we may label a consumer's behavior of actively looking for information as "information search", and a consumer's behavior of following the information the consumer receives as "information follow"; and we may label information overload from searching information as "information search overload" and information overload from following information as "information follow overload".

Our research aims to investigate whether information search overload and information follow overload are different, and whether they are associated with consumers' activities involving information differently. While the literature shows information overload as related to consumer behavior such as consumer Internet usage (e.g. Li, 2016) and consumer online social interactions (e.g. Jones, Ravid, and Rafaeli, 2004), there has rarely been research about how information overload from information search and from information follow are different, or how they associate with consumer behavior such as reading, Internet usage and online social networking behavior differently. Our preliminary research in this paper will help to fill this gap in the literature.

The rest of the paper is organized as the following: First, there is a literature review about information overload, particularly the research relevant to searching and following information; second, there is a section about the data and variables; third, there is the section of our empirical analysis and results; and fourth, there is the conclusion part, including managerial implications and discussion.

Literature Review

Based on the recent summary paper of literature review by Roetzel (2019) and Melinat, Kreuzkam and Stamer (2014), who incorporated the

review papers by others such as Eppler and Mengis (2004) and Edmunds and Morris (2000), the past literature of information overload focuses on cognitive burden from excessive information, though it also considers information overload from the perspective of limited resources e.g. time or budget. Therefore, following those significant past literature review (Roetzel, 2019; Melinat, Kreuzkam, and Stamer, 2014; Eppler and Mengis, 2004; Edmunds and Morris, 2000), we may consider information overload as a state of a consumer feeling cognitively overloaded when facing excessive information in terms of time and financial budget, complexity of the problem, and redundancy and inconsistency in the information available. In our information age with large amount of information, both information search and information follow may cause information overload to the consumers (Roetzel, 2019).

Information overload has been mentioned together with information search and information follow in the literature. Information search is often considered a critical part of individual's information processing behavior (Moorthy, Ratchford, and Talukdar, 1997). Information search over the Internet may cause information overload (Berghel, 1997), whereas information overload may influence information search (Swar, Hameed, and Reychav, 2017). Information overload has also been investigated from the perspective of consumer's information search strategies (Koulayev, 2014), such as consumer search costs (Branco, Sun, and Villas-Boas, 2016) and monetary returns to search as a result of lower prices from additional time investment in price search (Ratchford and Srinivasan, 1993). Moreover, information overload has been investigated from the perspective of consumer's search behavior, such as different search behavior of professional and non-professional financial analysts (Anderson, 1988). Overload from information search may cause negative effects in the cognitive process and there has been research about such negative effects (e.g. Anderson and de Palma, 2012; Sicilia and Ruiz, 2010), and information overload may cause different information search patterns (Shields, 1980). However, research rarely analyzes information search as potential source of information overload (Roetzel, 2019), and the research about information search as a possible source of information overload usually focuses on the limited time that often causes pressure and often leads to information overload (Misuraca and Teuscher, 2013; Roetzel, 2019; Scheibehenne, Greifeneder, and Todd, 2010).

Information overload also relates to information follow. In today's marketplace there is rising pressure to keep up with the exploding stream of information (Hunt and Newman, 1997). Even the information age may be defined as an excessive flow of information exceeding our ability to process it (Anderson and de Palma, 2012). Information about products consumers need to follow in the marketplace is overwhelming and causes overload (Jacoby, 1984), since too much information creates sensory overload to the consumers (Malhotra, 1982). News the consumers need to follow may create information overload (Holton and Chyi, 2012). Too many emails the employees need to follow may make the employees to ignore important content and cause trouble to the enterprises (Bawden and Robinson, 2009; Melinat, Kreuzkam, and Stamer, 2014; Roetzel, 2019; Sevinc and D'Ambra, 2010; Tungare and Perez-Quinones, 2009), and consumers often have overloaded email boxes so they may not follow all of them (Whittaker and Sidner, 1996). Particularly, too many emails the receivers need to process create much burden to the receivers of information (Sevinc and D'Ambra, 2010). As a result, e-mail-free workdays may be used to offset such negative effects (Bawden and Robinson, 2009; Roetzel, 2019). Design of the information channels, such as information display and asset choice (Agnew and Szykman, 2005), website reorganization (Lin, 2006), website structure improvement (Chen, 2018) and website personalization (Tam and Ho, 2006) may influence the information overload problem, which also suggest that the load of information consumers have from following information may be influenced by how the sources of information are structured and organized. Information overload has also been found to impede perceptual process such as attention (White and Carlston, 1983), hinder consumers' attention to certain information source (Anderson and Palma, 2012), and create limited attention spans (Bray, 2008).

Consumer activities such as usage of the Internet, usage of social network sites/apps, and reading/listening to books may be related to information overload, as the sources of information often play important roles in situations around information overload (Roetzel, 2019). The literature has related information overload to consumer activities, such as decision making (Malhotra, 1982) which may include purchase decision making (e.g. Chen, Shang, and Kao, 2009) and brand choice decisions

(Jacoby, Speller, and Berning, 1974). The Internet has influenced consumers' search behavior (Shaver, 2007), and it will undoubtedly continue to generate influence (Peterson and Merino, 2003). With the arrival of the Internet, information overload has become more problematic than before (Savolainen, 2007). Everyday activities such as using the Internet and addiction to the Internet has brought information overload to many people (Griffiths, 2000; Soule, Shell, and Kleen, 2016), and Internet addiction may cause behavioral disorder (Griffiths and Pontes, 2014). New technology such as the Internet makes individuals to view more information than they desire to process, which often causes information overload (Heylighen, 2002). Moreover, mobile technologies may intensify information overload (Allen and Shoared, 2005), and online activities may generate information overload to consumers (Li, 1996). Complex social interactions may generate information overload (White and Carlston, 1983), especially, interpersonal communications online may create information overload (Harper, 2010; Jones, Ravid, and Rafaeli, 2004). Excessive interactions or communications may generate information overload (Lewis, 1996), which is often intensified by new technology such as the Internet in recent years (Ljungberg and Sorensen, 1998); meanwhile, research about online activism shows information overload from communications often imposes problems to the audience (Nielsen, 2009). Many problems of information overload are found to come from social network apps (Melinat, Kreuzkam, and Stamer, 2014) such as Twitter (Sasaki, Kawai, and Kitamura, 2015) or Facebook (Koroleva and Kane, 2016; Li and Sun, 2014). Relevant to that, participation in social networks may affect people's feeling of information overload (Lee, Son, and Kim, 2016) and different designs of social networking sites may affect information overload (Koroleva and Bolufe-Rohler, 2012). Social networking by technology may cause social network service fatigue (Lee, Son, and Kim, 2016), and online social networking may cause psychological distress which may result in overload (Chen and Lee, 2013).

Although information overload has been typically associated with new digital technologies such as the Internet and social network app, actually information overload was considered as existing from thousands of years ago and the abundance of books was associated with it (Blair, 2011). Information overload has been associated with book reading since the 18th

century (Ellison, 2017). And from the 16th to the 18th century, "the multitude of books" was a source of anxiety (Blair, 2003). However, as book reading became a traditional form of information-related behavior, through new forms of information-related behaviors such as social networking over the Internet and apps, people consume more information on the Internet (Levitin, 2014), and the large-scale digitalization in our current age became a threat to book reading (Gooding, Terras, and Warwick, 2013). Therefore, does book reading (including e-book reading and listening) still work as a major contributing factor to information overload, or is it no longer such a factor compared to the Internet and social network apps? Following the literature, our research analyzes the relationships between information overload and the Internet, social network apps and book reading; expanding the literature, our research analyzes information overload as information overload from information search versus from information follow, and explores their relationships to the Internet, social network apps and book reading.

The Data and Variables

To analyze if information search overload and information follow overload are different, we use a dataset from the Pew Research Center's Internet, Science and Technology Project (Horrigan, 2016a). This dataset was from the libraries survey in 2016 by Princeton Survey Research Associates International for Pew Research Center, which analyzed technology use and information needs (Horrigan, 2016a; Pew Research Center, 2016). The survey has 9 parts: Introduction, civic and community engagement, technology assets, info requirements and info overload, reading/e-reading, library use, tech at libraries, attitudes on libraries' role, and demographics, which covered interviews with 1600 respondents 16 and older in all 50 states of the United States, March 7 to April 4 in 2016; among the respondents, about half were for Form A including questions relevant to social network apps (Pew Research Center, 2016). As this is a preliminary study, we focus on the two most common demographic variables: Sex and age. After excluding the respondents with inaccurate answers, the descriptive statistics in Table 1 below indicate the reliability

of the dataset: Due to the 2016 population estimates (United States Census Bureau, 2016), there were 159,078,923 males and 164,048,590 females with the percentages of 49.23% as males and 50.77% as females, which are close to the Pew Research Center (2016) sample. The median age in the 2016 population estimates (United States Census Bureau, 2016), including answers from people younger than 16 years old, was 37.9, which is lower than the median age of 51.00 in the Pew Research Center (2016) sample, as the sample only included people 16 years and older. Moreover, Pew Research Center conducted research of 4 reports with descriptive statistics on this dataset: Information Overload (Horrigan, 2016a), Social Media Update 2016 (Greenwood, Perrin and Duggan, 2016), Libraries 2016 (Horrigan, 2016b) and Book Reading 2016 (Perrin, 2016). Those reports with widely accepted results also indicate the reliability of the dataset.

Table 1. Descriptive statistics of demographic variables sex and age

Variable			Count	Percent (%)
Sex	Male		814	51.81
	Female		757	48.19
	Sum		1571	100
	Min	Max	SD	Mean	Median
Age	16	95	18.85	49.31	51.00

Source: own elaboration based on the data Pew Research Center (2016).

In the survey (Pew Research Center, 2016), in the section of "info requirements and info overload", there is a scale Q2 with 6 items: Q2a is "I sometimes feel stressed about all the information I have to keep track of" and Q2f is "It is sometimes difficult for me to find the information I need". Q2a describes information overload from following large volume of information and may be labeled "information follow overload"; Q2f describes information overload from searching a lot of information and may be labeled "information search overload". In the survey (Pew Research Center, 2016), each item in the scale Q2 has those choices for the respondents: 1: very well; 2: somewhat well; 3: not too well; 4: not at all well; 8: don't know; and 9: refused. Excluding the respondents with

choices of 8 and 9 and reversing the numbers 1–4 associated with the choices so that larger numbers indicate larger information search or follow overload, we have Table 2 below. From it we can already see that Q2f (information search overload) and Q2a (information follow overload) are not totally the same. Since Q2f is about information search overload and Q2a is about information follow overload, we put Q2f in front of Q2a for convenience.

Table 2. **Distribution of the answers to information search overload and information follow overload**

Variable		Not at all well: 1	Not too well: 2	Somewhat well: 3	Very well: 4
Q2f (Information Search Overload)	Count	620	379	374	166
	Percentage	40.2859	24.6264	24.3015	10.7862
Q2a (Information Follow Overload)	Count	580	303	404	252
	Percentage	37.6868	19.6881	26.2508	16.3743

Source: own elaboration based on the data Pew Research Center (2016).

In the survey (Pew Research Center, 2016) there are also items about consumer activities with multiple levels: Intfreq (Internet usage),[1] Sns2 (social media sites/apps usage),[2] and Books1 (book reading/listening).[3] Individuals may use different means such as books, social media and the Internet to search information, also they may receive from them a lot of information they need to follow. So, those items may relate to information search overload and information follow overload. There is a scale Q8 with 4 items in the section of reading/e-reading in the survey (Pew Research Center, 2016) about the amount of reading for information for different purposes: a. for work or school; b. for pleasure; c. to keep up with current events; and d. to research specific topics you're interested in. Reading for different purposes may relate to information search overload and information follow overload differently. We reversed the numbers associated with the choices for Intfreq, Sns2 and the 4 items of Q8 so that larger numbers indicate more usage or amount.

Analyses and Results

R 3.6.1 was the software for our analysis. First, we ran correlation analysis on Q2f (information search overload) and Q2a (information follow overload) and the results are in Table 3 below. The two kinds of information overload are significantly positively correlated, but the correlation coefficient is only about 0.34. Such results suggest that information search overload and information follow overload often happen at the same time but not all the time, so they are probably different.

Table 3. Correlation between information search overload and information follow overload

Variable		Q2f	Q2a
Q2f (Information Search Overload)	Spearman Correlation Significance N	1.0000000 . 1539	0.3436841 < 2.2e–16 1539
Q2a (Information Follow Overload)	Spearman Correlation Significance N	0.3436841 <2.2e–16 1539	1.0000000 . 1539

Source: own elaboration based on the data available: Pew Research Center (2016).

Second, after excluding the respondents with inaccurate answers to Books1 (book reading/listening), Sns2 (social network sites/apps usage) and Intfreq (Internet usage), we ran ordinal logistic regression with Q2f and Q2a as the dependent variables separately, and Books1, Sns2, and Intfreq as the independent variables. the results are in Table 4 and 5.

Such results suggest that information search overload and information follow overload are different in how consumer activities relate to each of them. For example, if we use 0.05 as the threshold for significance, information search overload is significantly negatively influenced by Internet usage, while information follow overload is not. If we use 0.1 as the threshold for significance, we may also say that information follow overload is positively influenced by social network app usage, and negatively by Internet usage. Such results may suggest that the phenomenon of

"information addiction" (Hemp, 2009) applies more to information search and less to information follow. Such results may also suggest that while we have much information to follow nowadays, browsing the Internet is better than using social network apps.

Table 4. **Ordinal logistic regression with information search overload as the dependent variable**

Coefficients	Estimate	Standard Error	t value	Pr (>|t|)
Books1	–0.003619	0.003266	–1.108101	0.268
Sns2	0.002626	0.015305	0.171555	0.864
Intfreq	–0.301386	0.076217	–3.954328	0.000
1|2 (Intercept)	–1.531283	0.290199	–5.276658	0.000
2|3 (Intercept)	–0.491757	0.283889	–1.732214	0.083
3|4 (Intercept)	1.088059	0.293162	3.711462	0.000

Source: own elaboration based on the data Pew Research Center (2016).

Table 5. **Ordinal logistic regression with information follow overload as the dependent variable**

Coefficients	Estimate	Standard Error	t value	Pr (>|t|)
Books1	–0.004992	0.003114	–1.603199	0.109
Sns2	0.026937	0.015285	1.762291	0.078
Intfreq	–0.134773	0.074827	–1.801124	0.072
1|2 (Intercept)	–0.996032	0.282129	–3.530411	0.000
2|3 (Intercept)	–0.020777	0.279105	–0.074442	0.941
3|4 (Intercept)	1.440515	0.287200	5.015723	0.000

Source: own elaboration based on the data Pew Research Center (2016).

Third, we added Sex and Age to the ordinal logistic regression as independent variables, where we used dummy for the variable Sex. The results are in Table 6 and 7.

Table 6. Ordinal logistic regression with information search overload as the dependent variable and sex and age in independent variables

Coefficients	Estimate	Standard Error	t value	Pr (>|t|)
Books1	–0.002564	0.003366	–0.761796	0.446
Sns2	–0.007305	0.016403	–0.445361	0.656
Intfreq	–0.323704	0.077530	–4.175239	0.000
Age	–0.008077	0.004517	–1.788229	0.074
Sex:male	–0.009431	0.146017	–0.064586	0.949
1|2 (Intercept)	–2.060133	0.424039	–4.858360	0.000
2|3 (Intercept)	–1.018956	0.418579	–2.434324	0.015
3|4 (Intercept)	0.565484	0.422503	1.338415	0.181

Source: own elaboration based on the data Pew Research Center (2016).

Table 7. Ordinal logistic regression with information follow overload as the dependent variable and sex and age in independent variables

Coefficients	Estimate	Standard Error	t value	Pr (>|t|)
Books1	–0.006199	0.003220	–1.925105	0.054
Sns2	0.011073	0.016294	0.679615	0.497
Intfreq	–0.135641	0.076449	–1.774258	0.076
Age	–0.007193	0.004474	–1.607685	0.108
Sex:male	–0.499878	0.145573	–3.433874	0.001
1|2 (Intercept)	–1.743428	0.420024	–4.150779	0.000
2|3 (Intercept)	–0.751893	0.415447	–1.809840	0.070
3|4 (Intercept)	0.727807	0.417891	1.741617	0.082

Source: own elaboration based on the data Pew Research Center (2016).

The results also suggest differences between information search and information follow. For example, if 0.05 is the significance threshold, Internet usage negatively influences information search overload significantly, which further confirms that "information addiction" (Hemp, 2009) may exist in information search, or that usage of the Internet may make consumers feel less information search overload and want to search for more information. On the other hand, if 0.1 is the significance

threshold, book reading/listening and Internet usage may influence information follow overload significantly negatively. Information search and follow overload are different with demographic variables as well: People of more senior ages tend to have less information search overload while people of different genders tend to have different information follow overload.

Fourth, we ran ordinal logistic regression analysis with Q2f and Q2a as the dependent variables separately, and with the 4 items in the scale Q8: Q8a (reading for work or school), Q8b (reading for pleasure), Q8c (reading to keep up with current events) and Q8d (reading to research specific topics you're interested in) as the independent variables in each equation. The results are in Table 8 and 9.

Table 8. Ordinal logistic regression with information search overload as the dependent variable and the four items of reading for different purposes as independent variables

Coefficients	Estimate	Standard Error	t value	Pr (>|t|)
Q8a	–0.028592	0.044062	–0.648889	0.516
Q8b	–0.035766	0.054271	–0.659023	0.510
Q8c	–0.082595	0.055915	–1.477139	0.140
Q8d	–0.172645	0.063416	–2.722440	0.006
1|2 (Intercept)	–1.174678	0.217263	–5.406707	0.000
2|3 (Intercept)	–0.107559	0.211753	–0.507946	0.611
3|4 (Intercept)	1.459951	0.229508	6.361233	0.000

Source: own elaboration based on the data Pew Research Center (2016).

Table 9. Ordinal logistic regression with information follow overload as the dependent variable and the four items of reading for different purposes as independent variables

Coefficients	Estimate	Standard Error	t value	Pr (>|t|)
Q8a	0.014741	0.043615	0.337991	0.735
Q8b	0.011856	0.053092	0.223312	0.823
Q8c	–0.038144	0.056733	–0.672343	0.501
Q8d	–0.026199	0.063801	–0.410632	0.681
1|2 (Intercept)	–0.674461	0.213365	–3.161074	0.002
2|3 (Intercept)	0.261660	0.212249	1.232797	0.218
3|4 (Intercept)	1.727798	0.225587	7.659135	0.000

Source: own elaboration based on the data Pew Research Center (2016).

Such results also suggest differences between information search overload and information follow overload. They suggest that reading to research specific topics you are interested in negatively influences information search overload significantly, while reading for any purpose does not influence information follow overload. Intuitively, such results suggest that maybe reading to research specific topics a consumer is interested in makes consumers feel relaxed and less overloaded.

Conclusion

Our research proposes that information search overload and information follow overload are different. The results suggest significant differences between information overload from information search and from information follow in terms of their relationships to consumers' activities such as book reading or listening, Internet use, and use of social network apps. They also suggest significant difference between information overload from information search and from information follow in terms of their relationships to consumers' reading behaviors for different purposes for information. As results from a preliminary analysis, they indicate that further research in this area is worth pursuing.

Such results have managerial implications as well. For example, advertising messages constitute the information a lot of consumers experience nowadays (Anderson and de Palma, 2009), probably mostly as information they follow e.g. when they watch advertisements on TV, sometimes also as information they search e.g. when they surf the Internet actively. And to know clearly whether consumers' information overload is from information search or information follow may help the marketers know how to attract consumers' attention. Moreover, our results suggest that information overload from information search and from information follow may correlate with different consumer activities involving information differently and may relate to consumer behavior involving information for different purposes differently. Such results may help the marketers design their messages to the consumers and select the appropriate communication channels. Overall, our

research may help future research for building a more comprehensive model about information overload, information search and information follow.

Acknowledgement

Endnotes

[1] The question is "About how often do you use the internet?" and the choices are "Almost constantly", "Several times a day", "About once a day", "Several times a week", "Less often" and "Don't know" and "Refused".

[2] The question is "Thinking about the social media sites or mobile apps you use… About how often do you visit or use a. Twitter b. Instagram c. Pinterest d. LinkedIn e. Facebook?" and the choices are "Several times a day", "About once a day", "A few times a week", "Every few weeks", "Less often", "Don't know" and "Refused". We summed sns2a–sns2e to form Sns2.

[3] The question is "During the past 12 months, about how many books did you read either all or part of the way through? Please include any print, electronic or audiobooks you may have read or listened to" and the choices are "__ [Record exact number 1–96", "None", "97 or more", Don't know" and "Refused".

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Tingting He, PhD, Assistant Professor of Marketing at Governors State University in Illinois, United States — PhD in Marketing from Washington University in St Louis and MPhil in Marketing from the University of Manchester. She focuses on both quantitative modeling research and consumer behavioral research in marketing and published in various journals before.