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Improving online food safety communication: The role of media

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GRADUATE SCHOOL
Thesis/Dissertation Acceptance**

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By Jing Ma

Entitled

Improving online food safety communication: The role of media

For the degree of Doctor of Philosophy

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Date

IMPROVING ONLINE FOOD SAFETY COMMUNICATION:
THE ROLE OF MEDIA

A Dissertation

Submitted to the Faculty

of

Purdue University

by

Jing Ma

In Partial Fulfillment of the
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of
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West Lafayette, Indiana

To all of you

- For encouraging me to be the better version of myself
and for continuously believing in me.

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ABSTRACT

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Food safety is important as foodborne illness outbreaks cause great economic and societal losses. Efforts to protect public health and reduce foodborne illness outbreaks will not be fully effective unless the resulting information is communicated to consumers.

However, food safety communications have not been particularly satisfactory (Worsfold, 2006). If food safety information were more accessible, consumers would be more likely to use it (Worsfold, 2006). In this regard, the Internet presents great possibilities for communicating food safety information to the public. But media's role has been largely overlooked in existing literature. When the lack of research is combined with consumers' increasing interest in food safety (Food Safety News, 2016), the need to understand media's effect is pressing.

To further the understanding of media's role in influencing food safety communication outcome, three progressive studies were conducted. The first study explored consumers' preferences, motivations, information needs, and information usage. The second study examined consumers' experience interacting with websites used for food safety communication and mapped website characteristics to users' perceptions. The

third study investigated the relationships among website characteristics, perceptions, efficacies, and behavioral intention, and tested the impact of media on communication outcomes.

Results of Study 1 revealed that the Internet was consumers' preferred media choice for food safety communication. Among Internet-based platforms, websites were most preferred. Media, information, and source characteristics interact in influencing consumers' experience with the websites and later communication outcome. Thus, it is important to maintain or improve information quality while offering media functionalities that reduces users' efforts in information seeking.

Study 2 showed that consumers go through a two-stage process in food safety communication. First, consumers are informed (usually passively) about an outbreak. Then, after the risks and threat are evaluated, consumers become motivated and actively seek out additional information to make decisions and protect themselves. Additionally, in Study 2, the link between website characteristics and consumers' efficacy perceptions was established. It was also discovered that the relationships among efficacy components were complex and probably nonlinear.

In Study 3, relationships among website characteristics, perceptions towards such characteristics, efficacy perceptions, and behavioral intention were evaluated and tested statistically. It was discovered that website characteristics, through efficacy perceptions, influence consumers' intention to use the communicated information. The results offered support that media is indeed important and influential and that it works together with

information quality to shape consumers' behavioral intention. More specifically, features on websites that directly related to searchability (e.g. search box and site map) and saliency (specific information about foods and locations involved) were perceived to be most influential and should be specially considered in website design and maintenance.

CHAPTER 1. INTRODUCTION

This dissertation follows the non-traditional format and includes six chapters. Chapter 1 is an overall introduction to this dissertation. Chapter 2 contains a comprehensive literature review for all research questions that guided the dissertation. Chapters 3 - 5 include three articles corresponding to three studies that will be submitted to research journals. Finally, Chapter 6 discusses the overall findings related to all proposed questions, results, and conclusions. This non-traditional format then follows with a comprehensive list of all references used in Chapters 1-6 and any relevant appendix materials.

1.1 Introduction

Food safety is important as foodborne illness outbreaks cause great economic and societal losses. According to the recent estimates by the Centers for Disease Control and Prevention (CDC), each year one in six Americans (48 million) gets sick, 128,000 are hospitalized and 3,000 lose their lives because of foodborne diseases (CDC, 2014a). Foodborne illness outbreaks pose significant threats not only to public health, but to the economy as well. Food Safety News estimates that foodborne illnesses cost the economy more than 15.6 billion dollars each year (Flynn, 2014). At the restaurant level, foodborne illness outbreaks are devastating as well. For example, Jack in

the Box – almost 30 years after their own *E. coli* outbreak – still suffers a stock price drop whenever an *E. coli* outbreak happens. Often times, a company never fully recovers from a major food safety problem (Seo, Jang, Almanza, Miao, & Behnke, 2014).

Efforts to protect public health and reduce foodborne illness outbreaks will not be fully effective unless the resulting information is communicated to consumers. Improved food safety communication can not only help consumers in making safer food choices and thus reduce the instances of outbreaks, but can also provide motivation for businesses (e.g. restaurants) to strengthen their food safety controls. In fact, studies have shown that informing consumers about food safety will influence their behaviors (Choi, Nelson, & Almanza, 2011; Porucznik & Royal DeLegge, 2013), and communicating food safety information with consumers, such as publishing restaurant inspection scores, helps to improve food safety controls (Almanza, Ismail, & Mills, 2002; Jin & Leslie, 2002).

However, food safety communications have not been particularly satisfactory (Worsfold, 2006). Traditionally, food safety information has been communicated through passive medias such as TV and newspaper. Such communications have limited reach and relevance and reduce its impact (Charles & Lawrence, 1990; Dutta-Bergman, 2004). If food safety information were more accessible, consumers would be more likely to use it (Worsfold, 2006). In this regard, the Internet presents great possibilities for communicating food safety information to the public.

Internet-based platforms present a wide range of benefits that make them attractive alternatives for food safety communications. But despite its potential, online food safety

communication has not always been successful (Bortree & Seltzer, 2009)(Thackeray, Neiger, Smith, & Van Wagenen, 2012). This is partly because the media's role has not been studied extensively. When the lack of research is combined with consumers' increasing interest in food safety (Food Safety News, 2016), the need to understand media's effect is pressing.

1.2 Research objectives

This research takes a user-centered approach, which utilizes user feedback and focuses on user experience, and aims to understand the role of media in improving online food safety communication. To achieve this overall objective, three progressive studies were conducted. The first study (see Chapter 3) explored consumers' communication preferences and motivations, food safety information needs, and use of information. The second study (see Chapter 4) employed Website Experience Analysis (WEA) to understand how consumers experience websites used for food safety communication and link website characteristics with users' perceptions. The third study (see Chapter 5) built upon the results from studies one and two in an extended EPPM model to test on a large scale the impact of media characteristics on communication outcomes. Finally, best practices were identified to help improve online food safety communication. See specific research questions in Chapter 2. More specifically, the three studies are:

1. Food safety information on the Internet: Consumer media preferences.
2. How consumers interact with websites to obtain food safety information: An application of Website Experience Analysis (WEA).

3. Improving food safety communication on the Internet: Influence of media on different efficacy perceptions.

1.3 Research significance

The present research is an interdisciplinary research of food safety communication with a combination of research methods, including a survey, Website Experience Analysis, and a scenario-based survey. See Chapter 2 for more details. This research presented a comprehensive view of consumers' experiences using Internet-based platforms for foodborne illness outbreak information as it incorporates consumers' preferences with actual observations of their behaviors (with a real website). Additionally, the results of the three studies progressively extend the understanding of media's role in food safety communication. The first study explored preferences and underlying motivations and priorities that lead to such preferences, the second study observed consumers' interactions with websites and linked evaluations of website characteristics to perceptions, and the third study quantified the impact of media on behavioral intentions. The combined results significantly advanced the knowledge of how media can be used to improve food safety communication.

This research has both theoretical and practical applications. From the theoretical perspective, this research presents the following contributions. First, this research extends the scope of EPPM to incorporate novel constructs specific to media evaluations (process and message efficacies), which is valuable as media is determined to be influential to communication outcomes. This is the first time that process and message efficacies are

included, tested, and shown to be predictive of communication outcomes. This extension may also support EPPM's broader applications in communication and behavioral studies. Second, the combination of three studies, utilizing a variety of theories and methods, provides a useful and novel model for future studies of food safety communication. This research demonstrated the power of utilizing complementary research methods to examine the same core issue from different perspectives. Third, this research demonstrates that website characteristics themselves are not the basis upon which consumers form their intentions, but rather the meanings and perceptions users derive from experiencing such characteristics are essential in determining behavioral intentions. This highlights the need for future research to conduct user-centered research and shift focus from specific website characteristics to concentrated efforts to understand consumers' experiences. Fourth, source, information, and media characteristics interact and together they lead to perceptions and evaluations of the experience; going forward, it may not be realistic or meaningful to consider the impact of such characteristics separately. Fifth, the conceptualization of situational contexts for foodborne illness outbreaks using susceptibility and severity is successful, providing a model for further explorations. Sixth, food safety communication is unique and may be different from other types of health communication in that consumers' information needs are highly personal and situational. This highlights the importance of further explorations of consumers' food safety information needs that incorporate contexts.

This research also supplies a number of practical applications. First, it was discovered that foodborne illness communication is a two-step process. This suggests that to improve

communication effectiveness, communication efforts should focus on achieving different goals at different stages of this communication process – more specifically, to broaden the reach and inform more consumers at stage one, and to provide superior user experience at stage two. Thus, different communication strategies (including media employed) are appropriate. Second, the identified consumer preferences, particularly in media choices, provide a guideline for resource allocations. Third, the identification of website characteristics directly associated with consumers' perceptions of information quality and media usability, and later behavioral intentions, provide valuable design suggestions. Fourth, the direct comparison of new media (social media) and traditional online media (website) provides insights for entities that are attracted by social media's potentials. Fifth, some best practices were identified to help practitioners in managing their food safety communication efforts. Sixth, the observations of actual consumer interactions with existing websites highlight the areas for improvement and provides examples to follow.

CHAPTER 2. LITERATURE REVIEW

In the non-traditional dissertation format, this chapter provides a comprehensive discussion of all relevant literature for the topic of “Improving food safety communication online: The role of media.”

2.1 Food safety and food safety communication

Food safety is essential in protecting public health and consumers can play an important role in strengthening overall food safety control if they can get engaged and use food safety information in their food decisions. The following sections discussed the importance of food safety and food safety communication along with the current state of food safety communication.

2.1.1 Food safety is important

Burden of foodborne illness. An estimated 48 million cases of foodborne illness occur each year in the United States. In other words, one in six Americans gets sick from food-related diseases every year. In addition, foodborne illness causes approximately 128,000 hospitalizations and 3,000 deaths. Eight known pathogens account for the vast majority of illnesses, hospitalizations, and deaths; among these, norovirus causes the most

illnesses – 5.5 million each year. Although norovirus usually causes a mild illness, it is also the fourth leading cause of death – 149 deaths each year – as it affects a very broad range of population. Another well-known pathogen, *nontyphoidal Salmonella*, is the largest cause of death and takes 378 lives each year (CDC, 2014a).

Historically, the U.S. (as well as other countries) has been burdened with foodborne illness outbreaks. Some outbreaks have been so impactful that they have led to important regulatory changes and continued to have lasting influences on the U.S. society. The case of the Jack in the Box restaurant chain is one example. This outbreak happened in early 1993. At that time, 732 people were infected with a particularly virulent pathogenic strain of *E. coli* found in undercooked beef patties in hamburgers. Many of them developed serious complications, such as hemolytic uremic syndrome (HUS) that started with bloody diarrhea (CDC, 1993). This case is extremely impactful for several reasons: 1) the population most affected was children; 2) it generated widespread media coverage unlike any other previous outbreak; 3) Jack in the Box was later identified in violation of a recently passed cooking temperature law (state law); and 4) *E. coli* at the time was not well known and people were not fully aware of its danger. As a result of this outbreak, *E. coli* became a reportable disease to all state health departments and the Food and Drug Administration (FDA) increased the cooking temperature for hamburgers from 140 °F (60 °C) to 155 °F (68 °C). Jack in the Box never fully recovered from this negative event – to this day, whenever an *E. coli* outbreak occurs, Jack in the Box is often mentioned in media reports and their stock prices subsequently decline (Benedict, 2015; Seo et al., 2014).

We have not been free of serious outbreaks in recent years. The CDC actively tracks the number of cases each year, and a number of highly impactful and multi-state cases, especially in recent years, suggest that the war against foodborne diseases is far from over. In a 2012 outbreak and food recall related to *Salmonella* infections from cantaloupe, 261 cases were reported in 24 states; among the victims, 94 were hospitalized and 3 deaths were reported (CDC, 2012c). A massive recall – one of the largest food safety recalls in the United States – happened in 2008-2009 when *Salmonella*-contaminated peanuts and peanut-related products caused 714 cases of directly linked illness and may have contributed to 9 deaths (CDC, 2013b). In another outbreak in 2012, 58 individuals were reported to be infected with *E. coli* in nine states; of those, 33 (67%) were hospitalized and 3 developed hemolytic uremic syndrome (HUS) (CDC, 2012b). A Foster Farms chicken foodborne illness outbreak linked to *Salmonella* that started in 2013 and spanned a 17-month period was finally declared over in July 2014. This outbreak led to a total of 634 people becoming sick (the hospitalization rate was as high as 38%) in one of the longest running outbreaks (CDC, 2014b). Another multistate outbreak of *Salmonella* resulted in 356 victims in the same year (CDC, 2013a). In 2014, a *Salmonella* outbreak linked to bean sprouts resulted in a total of 115 people becoming infected in 12 states. In this outbreak, 25% of the ill required hospitalization (CDC, 2015d). Additionally, a *Listeriosis* outbreak linked to Blue Bell creameries in 2015 resulted in 10 illnesses, 10 hospitalizations and 3 deaths (CDC, 2015c). The list goes on. In fact, the CDC investigated 11 multi-state outbreaks in 2013, and 13 outbreaks in 2014, 11 outbreaks in 2015, and 7 so far (as of May) in 2016 (CDC, 2016a). In 2014, the worst 10

outbreaks where both the pathogen and the food source could be identified caused illnesses for 1,356 people (Andrews, 2014).

Impact of food safety events. Food safety events take people's lives, as seen in so many outbreaks. Moreover, food safety events not only threaten the public's health, they also have significant economic costs. The economic unit at U.S. Department of Agriculture (USDA) has data on costs associated with outbreaks linked to 15 major pathogens in the U.S. These 15 pathogens together are responsible for more than 95% of the illnesses and deaths from foodborne illnesses for which the CDC can identify the pathogen cause (USDA, 2014). According to calculations done by Food Safety News, foodborne illnesses cost the economy more than 15.6 billion dollars each year, and these foodborne diseases cause more than 8.9 million people to become sick, 53,245 hospitalizations, and 2,377 deaths (Flynn, 2014).

Food safety events are not only threatening the public welfare, they often are devastating to the companies associated with them. Foodborne illness outbreaks can generate recalls and lead to reputation damages that can hardly be recovered, as in the case of Jack in the Box. As a result, food safety events often lead to a lasting decline in product demand, extended costs associated with the recall, and shrinkage in company value (Seo, Jang, Miao, Almanza, & Behnke, 2013).

2.1.2 Food safety communication is important

The efforts to protect public health and reduce the number of people sickened in foodborne illness outbreaks cannot be successful if food safety information is not

communicated to consumers. In fact, engaging consumers has a number of essential benefits (Wilcock, Pun, Khanona, & Aung, 2004). Studies have shown that informing consumers about food safety will influence their behaviors (Choi et al., 2011; Porucznik & Royal DeLegge, 2013), and thus helps to improve food safety controls – for example, improving inspection results (Almanza et al., 2002; Jin & Leslie, 2002) and reducing the number of hospitalized cases (Jin & Leslie, 2002).

2.1.3 Effectiveness of food safety communication

Food safety communication is important and presents enormous benefits, but in the past, it has not been particularly successful. Sometimes it is hard for consumers to obtain food safety information, especially foodborne illness outbreak information. The following sections discuss the effectiveness of food safety communication as well as possible ways to improve such communication.

Traditional media. Traditionally, food safety information has been communicated through push medias that are passive in message delivery, such as TV and newspapers. In fact, the most common outlets for food safety information have been newspapers, television, and radio (Almanza, Nelson, & Lee, 2003). The major drawback in push communication is that users have few choices about what information they receive and when, so the information is likely to have low relevancy, resulting in lower information usage. Additionally, the limited reach of traditional food safety communications, combined with low relevancy, reduces the impact of such communication (Charles & Lawrence, 1990; Dutta-Bergman, 2004). If food safety information were more accessible

and the communication more engaging, consumers would be more likely to use it (Worsfold, 2006).

Internet-based food safety communication. In this regard, the Internet presents great potential in improving food safety communications as it offers high speed, low cost, high scalability, and high message fidelity (Glasgow, Klesges, Dzewaltowski, Estabrooks, & Vogt, 2006; Snyder, 2001; Thackeray et al., 2012; Trouten, 2013). In fact, Internet platforms have started to become the top choice for consumers for food safety information (Bruhn, n.a.; Charanza & Naile, 2012). Along with consumers' increasing interest in food safety and demand for accountability and transparency through the food system (Food Safety News, 2016), using the Internet for food safety communication becomes more appealing. But on the other hand, unequal access and unfriendly and unfamiliar designs hinder broader usage by the population at large (Cline & Haynes, 2001). It is thus even more important to examine how improvements can be made - starting with understanding Internet-based communication.

2.1.4 Internet-based communication

Web 1.0 and 2.0. The World Wide Web (or web) – based on the Internet – has been recognized to enhance human cognition and communication. The web was first introduced by Tim Burners-Lee in 1989 (Kamel Boulos & Wheeler, 2007). Much progress has been made to the web since its introduction, and the most important innovation might be its evolving capabilities to support enhanced (e.g. fast and interactive) communications. To be more specific, Web 1.0, which is the first generation of the web, could be considered

merely a means for disseminating/ broadcasting information. Web 1.0 applications allow limited user interactions or content contributions, and are considered to be “read-only” (Aghaei, Nematbakhsh, & Farsani, 2012). Unlike Web 1.0, Web 2.0 emphasizes users’ engagement in the communication. It focuses on Internet-based media where users become producers of information. User-generated content, usability, and interactivity are noticeable characteristics of Web 2.0 (O’Reilly, 2005, 2009).

Social Media. Social media is a rather broad concept that represents the Web 2.0 mindset. In general, social media is regarded as a service platform that engages users to simultaneously support mass and personal communication (Ellison, 2007). In other words, social media are Internet-based platforms that enable users to communicate with each other, share ideas and information, and interact. In recent years, social media has drawn scholarly attention as a promising alternative platform in health communication (Morahan-Martin, 2004; Pew Research Center, 2015a; Sillence, Briggs, Harris, & Fishwick, 2007; Xiao, Sharman, Rao, & Upadhyaya, 2014). Indeed, social media offers a number of unique benefits such as potential high interactivity and good social support that make it attractive for health communication (Cline & Haynes, 2001). But limited research in the context of food safety communication makes the role and place of social media largely unclear. Thus, to extend the understanding of media, social media is directly compared with other more traditional Internet-based platforms, such as websites.

In this research, social media – characterized by interactivity and user-generated content – is treated as a representation of the Web 2.0 concept and is compared to websites, which traditionally have functioned as a Web 1.0 platform. Granted that there are

discussions over concepts beyond Web 2.0, such as Web 3.0 and Web 4.0 (Aghaei et al., 2012), they are not as relevant in this discussion – as the comparison in this research focuses on the platform’s communication features/characteristics, such as interactivity and the capacity to support user-generated content. In sum, in this research, social media is used to represent platforms that are interactive in nature and is directly compared with traditional Internet-based platforms (e.g. websites) in food safety communications.

2.2 Information seeking behaviors

To understand consumers’ interaction with and usage of Internet-based platforms in an attempt to improve food safety communication, it is important to understand how consumers experience websites and seek information online.

2.2.1 Information needs – the drive

Consumers have different information behaviors driven by distinct information needs (Case, 2012, pp. 68-69). Uncertainty reduction is a common information need (Henefer & Fulton, 2005) that is particularly relevant to information behaviors that involve health issues. Humans sense differences between what they know and what they want to know and react by seeking information to reduce uncertainty (Atkin, 1973; Belkin, 1978; Belkin, Oddy, & Brooks, 1982; Belkin & Vickery, 1985; Krikelas, 1983). In situations where one’s health is at stake, it is not hard to imagine the need to reduce uncertainty by seeking out information and reducing the gap between what is known and what needs to be known. The assumption that humans would seek out information when facing decisions regarding their health is rooted in psychological studies of human behaviors.

For example, in Maslow's hierarchy of needs, the most basic human needs are physiological and safety needs – the needs for foods and safe foods; thus when facing decisions, individuals seek information to reduce uncertainty and to meet their physiological and safety needs (Maslow, 1943; Wilson, 1999).

2.2.2 Types of food safety information.

The FDA, CDC, and USDA, along with state and local governments (mainly health departments) collectively protect public health by educating the public about food safety, conducting restaurant inspections, and controlling and investigating foodborne illness outbreaks (Almanza & Ghiselli, 2014; CDC, 2015a; FDA, 2015; USDA, 2015). These efforts to ensure food safety result in different types of food safety information such as restaurant inspection results, foodborne illness outbreak and recall information, and seasonal food safety information. When developing appropriate communication strategies, these distinct types of food safety information should be treated differently. The primary reason for this distinction is that consumers may have different levels of urgency and continuity in their information needs, and this will result in different information seeking behaviors. For this reason, to yield meaningful results, this research focuses only on foodborne illness outbreak information (FBI).

2.2.3 Components of communication

Without the understanding of how communication happens, any attempts at improving communication outcome cannot be successful. The following sections review components of communication.

Components of communication. Shannon and Weaver (1949) proposed a simplified communication model known as the transmission model, suggesting that in order for communication to occur, four components are necessary: an information source or sender (which produces a message), a transmitter (which encodes the message into signals), a media (from which signals are transmitted), and a receiver (which decodes or reconstructs the message). Barnlund (1970) proposed a transactional model of communication and incorporated interactions between senders and receivers of information. Additional research has suggested the importance of purpose, context and timing (Agarwal, 2010). These findings have been consistently verified (Fox, 1983; Shannon, 1949; Shrigley, 1978; Wilson, 2005). With these in mind, this research controls for context (FBI outbreak) and timing (ongoing outbreak) while exploring the impacts of source, media, and information on receivers' behavioral intentions.

Distinction between source and media. In studying communications, the source (which produces a message) and the media (through which signals are transmitted) should be considered separately. This division is widely supported in the literature (Fox, 1983; Shannon, 1949; Wilson, 2005). Moreover, this distinction is especially important in Internet-mediated communication because source and media can have a different impact on communication outcomes. For example, when one source utilizes multiple media to communicate the same information, users may trust and thus use the information communicated over one media more than another (e.g. a health professional uses a personal blog vs. appearing on TV to promote the use of certain testing). Or people may treat and use information gathered from the same media but from different sources

differently (e.g. news on the Internet from Fox News vs. CNN). The present research focuses primarily on media effect in communication.

Interactions among source, media, and information. Uncertainties during a foodborne illness outbreak would be expected to create a drive for information; thus motivated, individuals' evaluation and later usage of information would be impacted by information quality, source characteristics, and media properties. When media can be evaluated separately from the source, information/content characteristics interact with media characteristics in determining communication outcome (Barry & Schamber, 1998; Frighetto & Wolf, 2014; Krikelas, 1983; Kuhlthau, 1991; Park & Lessig, 1981; Tversky & Kahneman, 1973; Young & Von Seggern, 2001). The characteristics of communications (e.g. source, information, and media characteristics) may be experienced differently by users and lead to different perceptions. For example, although all consumers want to get accurate information, perceptions of information/content may vary depending on the media which consumers use. It is thus important to examine users' experiences and perceptions of such characteristics in the attempt to explore media' impact on communication outcome.

2.2.4 Perceptions of website characteristics

Commonly, the characteristics of communications through websites (source, information, and media) lead to users' evaluations of information quality (how good the information is) and media usability (how usable the media is) (Al-Qeisi, Dennis, Alamanos, & Jayawardhena, 2014; Aladwani & Palvia, 2002; DeLone & McLean, 1992; Hanafi,

Kasim, Ibrahim, & Hancock, 2009; Huang & Benyoucef, 2013; Wixom & Todd, 2005).

Dimensions that are most commonly associated with evaluation of information quality and media usability were considered, consolidated, and presented in Table 2-1. In sum, within the context of communicating foodborne illness outbreak information, this research uses accuracy, timeliness, trustworthiness, applicability, saliency, quantity, transparency, understandability, accessibility, interactivity, searchability, usability, linkability, familiarity, and security to frame consumers' priorities in media selection in the attempt to understand consumers' information seeking behaviors.

Table 2-1. Dimensions, definitions, subscales, and supporting literature for information quality and media usability

Dimensions	Definition	Subscales	Supporting literature
<i>Information Quality</i>			
Accuracy	The information is accurate	Accuracy	Ahn, Ryu, and Han (2007); Bailey and Pearson (1983); Barry and Schamber (1998); Jarke and Vassiliou (1997); Kim, Eng, Deering, and Maxfield (1999); Lee, Strong, Kahn, and Wang (2002); Liu and Arnett (2000); McKinney, Yoon, and Zahedi (2002); Wang and Strong (1996); Wixom and Todd (2005); Young and Von Seggern (2001); Zmud (1978)
Timeliness	The information is current	Timeliness	Ahn et al. (2007); Aladwani and Palvia (2002); Bailey and Pearson (1983); Barry and Schamber (1998); Jacob, Lok, Morley, and Powell (2011); Jarke and Vassiliou (1997); Kim et al. (1999); Liu and Arnett (2000); McKinney et al. (2002); Wixom and Todd (2005); Young and Von Seggern (2001); Zmud (1978)
Trustworthiness	The source of information is trustworthy	Trustworthiness	Carlson (2007); Goodhue and Thompson (1995); Janneke de et al. (2004); Kim et al. (1999); Marlow (2004); Pieniak, Verbeke, Scholderer, Brunsø, and Olsen (2007); Yang, Cai, Zhou, and Zhou (2005)

Table 2-1 continued

Applicability	The information is applicable	Applicability	Ahn et al. (2007); Aladwani and Palvia (2002); DeLone and McLean (1992); HernáNdez, Jiménez, and Martín (2009); Larcker and Lessig (1980); Lin and Lu (2000); McKinney et al. (2002)
Saliency	The information is detailed and specific	Detailed information/ specificity	Aladwani and Palvia (2002); Bailey and Pearson (1983); Barry and Schamber (1998); DeLone and McLean (1992); Kim et al. (1999); Knijnenburg et al. (2013); Langfield-Smith (1997); Liu and Arnett (2000); McKinney et al. (2002); Wixom and Todd (2005); Yang et al. (2005)
Quantity	There is a large amount of information	Information quantity	Kim et al. (1999); Petts et al. (2000); Yang et al. (2005); Zmud (1978)
Transparency	The source of information is visible	Transparency	Kim et al. (1999); Marlow (2004); Pidgeon and Kasperson (2003); Rutsaert et al. (2013); Seeger (2006)
Understandability	The information is easy to understand and clear in meaning	Easy to understand	DeLone and McLean (1992); King and Epstein (1983); Lee et al. (2002); McKinney et al. (2002)
<i>Media usability</i>			
Accessibility	The access is fast and easy	Speed	Aladwani and Palvia (2002); Bailey and Pearson (1983); Huang and Benyoucef (2013); Kim et al. (1999); Krikelas (1983); Kuhlthau (1991); Lin and Lu (2000); Liu and Arnett (2000); McKinney et al. (2002); Wixom and Todd (2005)
		Ease of use	Aladwani and Palvia (2002); Barry and Schamber (1998); Krikelas (1983); Kuhlthau (1991); Yang et al. (2005); Young and Von Seggern (2001)
Interactivity	Users can interact with others, including other users and information sources	Interactivity	Aladwani and Palvia (2002); Kim et al. (1999); Kuang and Cho (2015); Palen, Vieweg, Liu, and Hughes (2009); Rutsaert et al. (2013); Shepherd (2008); Sundar (2007); Verbeke (2011); Yang et al. (2005)
Searchability	The navigation/ search is easy	Searchability	Aladwani and Palvia (2002); Alexander (2014); Barry and Schamber (1998); Papadomichelaki and Mentzas (2012); Young and Von Seggern (2001)

Table 2-1 continued

Appearance	The website is visually appealing	Visuals – use of pictures, videos, and appropriate colors	Aladwani and Palvia (2002); Mei, Bansal, and Pang (2010); Tarafdar and Zhang (2005); Verbeke, Frewer, Scholderer, and De Brabander (2007)
Linkability	The website supports outbound links to additional information	Linkability	Aladwani and Palvia (2002); Bailey and Pearson (1983); Kim et al. (1999); McKinney et al. (2002); Miller and Doyle (1987); Nelson, Todd, and Wixom (2005); Sethi (2007)
Security	The information seeking is conducted in a secure manner	Privacy settings/ controls and few advertisements	Al-Qeisi et al. (2014); Aladwani and Palvia (2002); Lee and Kozar (2006); Liu and Arnett (2000); Min, Li, and Zhong (2009); Papadomichelaki and Mentzas (2012); Wang and Strong (1996)
		No viruses	Freeman (2012); Freeman and Chapman (2008)
		Does not track user data	Aladwani and Palvia (2002)
Familiarity	The website is familiar to users/ users have used the website before	Familiarity	Frighetto and Wolf (2014); Park and Lessig (1981); Tversky and Kahneman (1973).

2.2.5 Perceptions of information quality and media usability

Characteristics of a website are experienced by users and contribute to formations of different perceptions and eventually result in different communication outcomes or behavioral intentions. Wixom and Todd (2005) made a significant contribution in highlighting media's significant role in communication by integrating previous literature in user satisfaction and technology acceptance and proposing a model that clearly distinguishes users' perceptions and beliefs about the system (i.e. perceptions of information quality and media usability) from users' perceptions and beliefs about using the system and its information. They further theorized that perceptions or beliefs towards

information quality and system quality (i.e. media usability) influence behavioral intentions (Wixom & Todd, 2005). Thus, this research further theorizes that website characteristics experienced by consumers will lead to perceptions towards source, information, and media, thus resulting in perceptions of information quality and media usability; and beliefs of information quality and media usability will eventually influence behavioral intentions.

2.3 Theoretical framework

While website characteristics may influence consumers' behavioral intentions, it is still unclear how this influence can take place. In studying health communications, particularly in situations where risk is involved, threat and efficacy perceptions are powerful in understanding consumers' behaviors. The models/ theories of Protection Motivation Theory, Parallel Response Model, and the later Extended Parallel Processing Model (EPPM) are widely cited as predictive of health and protection related behavioral intentions.

2.3.1 Fear appeal

The models begin with a fear appeal. The idea of a fear appeal is to communicate the risk so people are alarmed and paying attention, thereby increasing the likelihood of accepting the communicated message and avoiding the risk conveyed (Hovland, Janis, & Kelley, 1953). Risk represents danger and the possibility of a negative outcome. The inherent logic of fear appeal is that if a message is persuasive enough that it makes people aware of how much danger they are putting themselves in by engaging in a certain behavior,

this awareness would be expected to result in behavior changes in order to avoid danger and reduce risk (Yzer, Southwell, Stephenson, Rice, & Atkin, 2012). Four theories predominate in the fear appeal domain of research. These are the fear-as-drive model, the parallel process model, the protection motivation theory, and the extended parallel processing model.

Fear was initially deemed to be a drive as suggested by Hovland et al. (1953). A drive motivates people to change and the changes are considered responses. These changes/responses are made to improve emotions (e.g. the fear) and not necessarily to avoid the threat. Because of this, early attempts to induce fear to promote changes in behaviors did not produce consistent results as people could deny the risks. So Hovland et al. (1953) introduced the interpretation of “recommendation” in a fear appeal. In other words, a message or appeal should not only include a fear-inducing component but provide a coping strategy or recommendation as well. If the recommendation works to avert the threat and thus reduce emotional distress, the recommended action will become habitual when similar cues of threat are present. On the other hand, if the recommendation does not work as anticipated to reduce the unpleasant emotional state, people revert to more maladaptive strategies such as defensive avoidance (not thinking about the threat) and perceived manipulation (feeling manipulated thus angry). Janis (1967) later introduced the curvilinear model of fear – fear-as-drive model. In this model, fear inducement up to a certain level will increase adaptive responses, but when fear becomes too strong, adaptive responses will decrease. Thus, moderate fear is considered most effective in motivating desired behavioral changes.

The Parallel Response Model was proposed by Leventhal and Watts (1966) to extend the understanding of how individuals process threat and fear. This model proposed that fear is not the only immediate response after a fear appeal. In this model, a threat is processed, which then triggers danger control or fear control or both. Danger control occurs when people process the threat and engage in actions to avert the threat while fear control happens when people think about strategies to control their fear (not necessarily the threat). This model does not stipulate when people engage in danger control, fear control, or both and if these two processes interact. In response to the lack of specificity, Rogers (1975) introduced and later improved (1983) the Protection Motivation Theory (PMT). PMT focuses only on the danger control response side of the parallel response model. PMT proposed that there are four components involved in a fear appeal: perceived vulnerability, perceived severity, response efficacy, and self-efficacy. PMT further suggests that these four components will produce two processes: threat appraisal and coping appraisal. In their model, perceived vulnerability and perceived severity induce a threat appraisal, while response efficacy and self-efficacy elicit a coping appraisal. The threat appraisal assesses the severity of the situation and the coping appraisal frames how people respond to the situation. Protection motivation (leading to desired attitude and behavioral changes) will be maximized if both appraisals are positive. PMT advances our understanding of risk communication in that it helps to define the nature of threat and coping components of a fear appeal; however, it did not explore fear's role as an emotion in explaining and promoting behavioral changes.

2.3.2 The Extended Parallel Processing Model (EPPM)

EPPM. Witte (1992) reintegrated affective process with Rogers's work of cognitive process of fear (1975, 1983) and built upon Leventhal's framework of parallel danger and fear processes (1970). She introduced the Extended Parallel Process Model (EPPM). EPPM suggests that after exposure to a fear appeal, an individual forms the perception of threat based on the severity of the threat and how susceptible the individual is to the threat. The more severe the situation and the more susceptible the individual is, the more they are motivated to begin the second appraisal – evaluation of the efficacy of the recommended response. Their perception of response efficacy (how effective is the recommended response in reducing the threat) and self-efficacy (if they believe they can perform the recommended response) is formed and combined with their perceived level of threat, thereby leading to their response choice. There are three possible outcomes after the fear appeal. Individuals can ignore the message if the threat is perceived to be low or irrelevant (so the efficacy appraisal is not even triggered). Alternatively, individuals can engage in danger control, where they process the message and take the recommended actions. This is more likely to occur from a combination of high threat perception and high efficacy perception. Or individuals can engage in fear control when they are exposed to a serious threat without a perceived effective response or they do not believe they can successfully perform the response and avoid the threat. In other words, a high threat combined with low efficacy will trigger danger control. Fear control is an emotional process, unlike danger control, which is processed cognitively. When engaged in fear control, people cope and control their fear, but not the danger. See Figure 2-1.

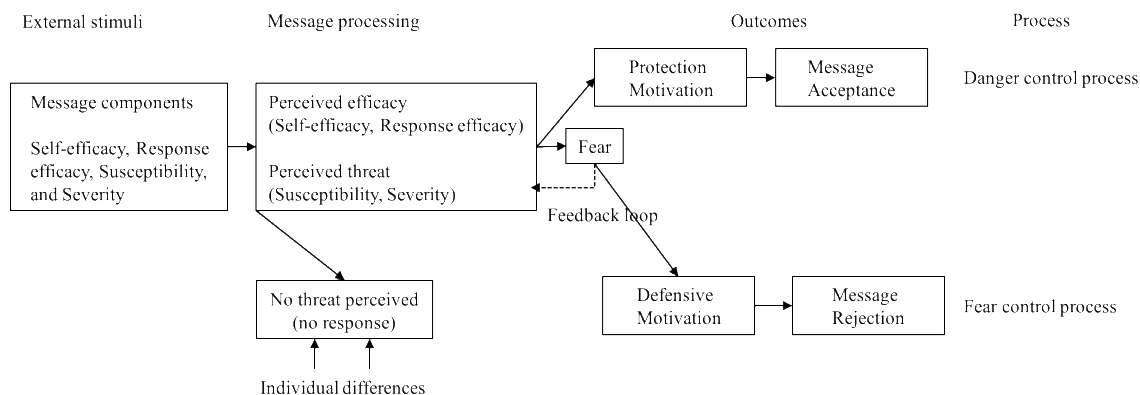


Figure 2-1. Extended Parallel Process Model (EPPM)

Source: Witte (1994)

Why EPPM. EPPM's quality has been evaluated (Maloney, Lapinski, & Witte, 2011) and results of several meta-analyses suggested that EPPM is powerful and useful (Webb, Joseph, Yardley, & Michie, 2010; Witte & Allen, 2000). EPPM is particularly applicable to this research for the following reasons. First, the conceptualization of antecedents – threat and efficacy of behavioral changes matches well with the reality of food safety communication. The focus of food safety information in this research will be foodborne illness outbreaks because these are primary examples where a timely need for food safety information may manifest in an Internet search for information. A foodborne illness outbreak is inherently risky and presents immediate hazard, so it can be conceptualized as the fear stimuli that would trigger the perception of threat. Effective communication through websites would be helpful in empowering audiences to make safer dining choices thus improving their perceptions of efficacy, so the audiences will accept and use the information and manage the threat (instead of ignoring the risks). In other words, EPPM conceptualization of motivational factors (based on fear) that would activate behavioral

response can be applied in food safety communication. Second, EPPM, by incorporating both threat and efficacy components, indicates how to improve communication outcomes. More specifically, EPPM predicts that when confronted with fear-inducing stimuli, a higher level of perceived efficacy will increase message acceptance (Witte, 1994). In this regard, EMMP allows the identification of ways to improve outcomes of food safety communication online. Third, EPPM has flexibility that allows the incorporation of website characteristics (Witte, 2015). Websites present unique media characteristics (e.g. interactivity and searchability) and content characteristics (e.g. the possibility of more timely updates) that could change users' perceptions of efficacy and/or threat.

Some recent critics of EPPM have argued that EPPM does not take into consideration the possible interaction between threat and efficacy perceptions. A recent meta-analysis has provided evidence that there is an interaction effect between threat and efficacy - threat only had an effect under high efficacy and efficacy only had an effect under high threat (Peters, Ruiters, & Kok, 2013). Because of this, this research only focuses on possible improvements in communication outcomes when consumers are confronted with high level of threat. Future studies may explore other possibilities.

2.3.3 A new take on EPPM

Focus of the prediction. Since its introduction, EPPM has been widely adopted to develop effective risk communication messages, specifically messages that would elicit adaptive behavioral responses (Gore & Bracken, 2005; McMahan, Witte, & Meyer, 1998). Outside message design, EPPM has been applied to assess attitudes towards an

action (Barnett et al., 2009) and predict behaviors (Hullett & Witte, 2001; Roberto & Goodall, 2009). This research attempts to build upon and extend EPPM's traditional applications and test to determine if EPPM can be used to examine effects of media on communication effectiveness.

Incorporates constructs specific to communication media. Health communications are increasingly happening over digital media (Rice & Atkin, 2012). To incorporate perceptions related to unique characteristics of websites, this research proposes two additional efficacy components - message efficacy (perception of information quality) and process efficacy (perception of media usability) to be included in the model. In this research, the four types of efficacy are defined as the following: Self-efficacy - a person's belief that he or she has the ability to find needed information (about foods and restaurants to avoid); response efficacy - a person's belief that using the information found reduces the risk of getting sick, message efficacy - a person's belief that the information found is of high quality; process efficacy – a person's belief that the process of finding needed information is easily done.

Construct operationalization. Research has suggested that the operationalization of EPPM constructs lacks consistency (Popova, 2012), and this is also reflected in literature review. So, instead of applying any pre-existing operational definitions of the constructs, this research started with thoroughly developed theoretical concepts in EPPM and operationalizes these theoretical concepts/ constructs into measureable variables according to the context of this research. See Study 3 for more details.

2.4 Research questions

In the past, media's potential contribution in improving communication outcomes has received limited scholarly attention. Overall, within the context of foodborne illness outbreak communication, the role of media has been largely overlooked (Rutsaert et al., 2013). Researchers have focused on benefits of new media (Rutsaert et al., 2014), effects of communication and intervention (Mayer & Harrison, 2012; Mitchell, Fraser, & Bearon, 2007; Powell, Jacob, & Chapman, 2011), user typology (Kuttschreuter et al., 2014), and message formation (Gordon, 2003). This lack of research limits scholars' ability to fully explore ways to improve usage of Internet-based communication platforms in food safety communication. To address this issue, this research utilized three studies to examine media's role in food safety communication. The three studies are laid out as:

1. Food safety information on the Internet: Consumer media preferences – to explore consumers' media preferences and motivations, food safety information needs, and use of information.
2. How consumers interact with websites to obtain food safety information: An application of Website Experience Analysis (WEA) – to understand how consumers experience websites used for food safety communication and link website characteristics with users' perceptions.
3. Improving food safety communication on the Internet: Influence of media on communication outcome – to examine the impact of media characteristics and

different efficacy perceptions on communication outcome; and to identify best practices when using Internet-based platforms for food safety communication.

More specifically, this research is guided by the following research questions:

1. What are the preferred media for consumers to obtain foodborne illness outbreak information? (Study 1)
2. What are the priorities for consumers in their media selection? (Study 1)
3. What website characteristics are experienced by consumers that influence their efficacy perceptions (response, self, process, and information) towards the communication? (Study 2)
4. What are the relationships among the efficacy perceptions (self, response, process, and message)? (Studies 2 and 3)
5. How will different Internet platform characteristics (media, information, and source characteristics) contribute to improving food safety communication outcomes (behavioral intentions)? (Study 3)
6. When confronted with a threat, will a higher level of perceived efficacy (including process and message efficacy) improve communication outcomes? (Study 3)
7. Is EPPM useful in understanding food safety information-seeking behaviors? (Study 3)

The overall research framework of the three studies is shown below in Figure 2-2.

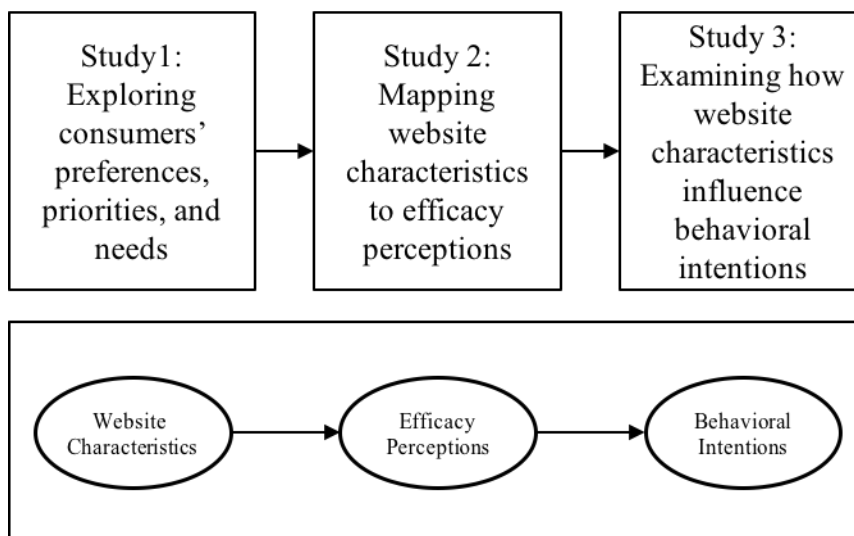


Figure 2-2. Research Framework

2.5 Research method choices

To address the research questions, a combination of three studies was designed and implemented. The first study utilized a survey to gauge consumer preferences, motivations, and needs. Building on the results of Study 1, Study 2 employed Website Experience Analysis (WEA) and mapped website characteristics to consumer perceptions. Finally, Study 3 tested how changes in media perceptions would impact communication outcomes from Studies 1 and 2 in the extended EPPM model using a scenario-based survey.

2.5.1 Review of method choices

There are three major streams of research that are relevant to studies about communication effectiveness. Each stream relies more heavily on a specific type(s) of methodology to gather and analyze data. For example, one research stream focuses on the

audience or information receiver and uses survey and interview methodologies. A second focuses on the information source and message, or social media posts in this case. This research stream utilizes content analysis, machine mining, or analysis of social media posts. Finally, the third stream focuses on the communication process or interaction, as well as the relationships among the information users and between the source and the audience. This stream often conducts network analyses.

Because the purpose of Study 1 was to understand consumers' motivations and preferences, a survey methodology was utilized to gather both quantitative data and some open-ended response data. For the second study, which mapped consumers' perceptions of website characteristics, Website Experience Analysis (WEA) was applied to collect qualitative data. Finally, the third study, which addressed the relationships among website characteristics and users' perceptions and influence of perceptions on communication outcomes, employed a scenario-based survey to collect quantitative data on a larger scale. The reasons for these choices are discussed below.

2.5.2 Survey

Among the most widely used research methods in the social sciences, the survey has been widely used to gauge participants' perceptions, understanding, motivation and reasoning for actions. Compared to interviews and focus groups, which are used to collect more detailed and in-depth qualitative data, the survey is generally used for collecting quantitative data on a large scale. The survey focuses on the audience in communication, especially targeting a better understanding of the audience's attitudes, perceptions,

motivations, etc. Surveys are also useful in establishing or testing relationships among variables as it provides quantitative data to support statistical analysis (such as regression). For example, Ellison, Steinfield, and Lampe (2007) used a survey to collect quantitative data to examine the relationship between the use of Facebook and the formation and maintenance of social capital. In another study, a survey was used to study consumers' motivations for reading and contributing to restaurant reviews on Yelp (Parikh, Behnke, Vorvoreanu, Almanza, & Nelson, 2014). Thus, surveys were considered to be appropriate for Study 1 and 3 data collection.

2.5.3 Website Experience Analysis

Rather than characteristics of a website, the second study focuses on users' perceptions of such characteristics. It is users' perceptions towards website characteristics rather than website characteristics that influence users' behavioral intentions. Website Experience Analysis (WEA) allows users' experiences and perceptions of the websites to be captured and thus was considered as the research method for Study 2.

Website Experience Analysis (WEA) was proposed by Mihaela Vorvoreanu as a new research protocol in studying website experience (Vorvoreanu, 2004, 2006, 2008a, 2008b). WEA adopts a research perspective that focuses on the user's experience rather than the structural characteristics of the platform alone. The reasons for adopting a user-centered approach are grounded in communication theories. Meaning is not embedded in the text, waiting to be discovered by users. Meaning is created in the process of reading and interacting with the website (Fish, 1980). Thus, methodologically, analyses based on

texts (such as content analysis and analysis of social media posts) should be replaced by observation and analysis of people's experiences and perception or attitude changes while using and interacting with the media (Vorvoreanu, 2004).

WEA is particularly suitable for answering the research questions of Study 2 as it allows mapping of users' perception to specific characteristics of the media. Additionally, WEA supports the mapping of users' perceptions to specific characteristics of the media, which extends the understandings of users' perceptions that were not possible to capture in Study 1 and builds foundations for Study 3. For example, Study 1 found that timeliness is important, but it was unclear if timeliness is directly related to evaluation of the media or the information. As previous literature provides inconsistent results (Aladwani & Palvia, 2002; Wixom & Todd, 2005), it is necessary to map website characteristics to consumers' perceptions before such characteristics' role in influencing communication outcomes can be examined.

In addition, WEA offers a few unique benefits. First, WEA allows direct observations to be made of users' behaviors. This overcomes the potential biases presented by survey and interview research (e.g. what users think they would do may be different from what they actually would do). Second, WEA has built-in flexibility that allows its applications in accordance with different theoretical perspectives and measurement models.

The research methods do not have to be applied alone. In fact, a combined method can often provide a more comprehensive understanding of the reality, as the understandings gained from using different methods are often complementary (Goggins, Mascaro, &

Mascaro, 2012; Pak & Paroubek, 2010). As such, this research utilized different research methods, as appropriate, for the three studies.

CHAPTER 3. STUDY 1: FOOD SAFETY INFORMATION ON THE INTERNET:
CONSUMER MEDIA PREFERENCES

The following study will be submitted to a peer-reviewed journal and is included in this non-traditional thesis/dissertation as chapter 3. This article is written in the APA style format.

3.1 Abstract

Foodborne illness outbreaks can cause considerable losses to the economy and society. In the past, efforts in communicating food safety information to consumers have not always been successful, partly because user expectations and preferences were not fully explored and understood. This study uses an online questionnaire to explore consumer media preferences in food safety communication, particularly about communication of foodborne illness outbreak information. Results of this study demonstrate the importance of the Internet as a media in communicating information about foodborne illness outbreaks. Despite the great potential of social media, websites are the preferred online platform for communicating foodborne illness outbreak information. Media characteristics, together with information and source characteristics, influence consumers' evaluation and preference of a media. Information quality is the most

important priority for consumers. Aside from it, searchability is the most valued media functionality for consumers when looking for foodborne illness outbreak information.

3.2 Introduction

Food safety is extremely important, as foodborne illness outbreaks can cause considerable losses to our economy and society (CDC, 2014a; Flynn, 2014). Foodborne illness outbreaks can be devastating to a company or brand as well. For example, Jack in the Box –almost 30 years after their own outbreak – still suffers a stock price drop whenever an *E.coli* outbreak occurs (Seo et al., 2014). Oftentimes, a company never fully recovers from a major food safety event (Seo et al., 2014). But efforts in ensuring food safety would not be successful if the resulting information is not communicated to consumers. In fact, communicating food safety information has been shown to be effective in engaging consumers (Choi et al., 2011; Porucznik & Royal DeLegge, 2013) and improving food safety controls – for example, improving inspection results (Almanza et al., 2002; Jin & Leslie, 2002) and reducing the number of individuals hospitalized (Jin & Leslie, 2002).

When evaluating communication efforts, it is important to separate media effect from source effect (Fox, 1983; Shannon, 1949; Shrigley, 1978; Wilson, 2005). Communication involves a number of elements, and the source (from whom) and the media (how) should be considered separately (Shrigley, 1978). This distinction is especially important in Internet-mediated communication because source and media can have different impacts on communication outcomes. For example, when one source uses multiple medias to

communicate the same information, users may trust and thus use the information communicated over one media more than another (e.g. a health professional uses a personal blog vs. appearing on television). Or, people may view information differently if it was gathered from the same media but from different sources (e.g. news on the Internet from Fox News vs. CNN). Overall, within the context of foodborne illness outbreak communication, the role of media has been largely overlooked (Chapman, Raymond, & Powell, 2014). Because of the importance of the issue, this study utilizes user feedback and explores consumer media preference, especially online media preference, for foodborne illness outbreak information.

Past food safety communication efforts have not always been successful as consumers feel it is sometimes hard to obtain food safety information, especially foodborne illness outbreak information (Worsfold, 2006). When it comes to communications, there are generally two forms, push and pull communication. Generally speaking, it is considered “pull” if users request and retrieve the information; and it is considered “push” if the information is sent in anticipation of users’ needs or in other words, the information is not directly solicited (Cybenko & Brewington, 1999). Traditionally, food safety information, along with other health-related information, has been communicated through push medias such as TV and newspapers. The major drawback of push communication is that users have few choices about what information they receive and when. This has limited the reach and relevance of food safety information communicated and thus the impact (Charles & Lawrence, 1990; Dutta-Bergman, 2004). Consumers indicated that if food safety information were more accessible, they would be more likely to use it (Worsfold,

2006). In this regard, the Internet, especially emerging platforms such as social media sites, presents great possibilities for communicating food safety information to the public.

Internet-based platforms, particularly social media sites, have the potential to be appropriate and effective for food safety communication since these platforms enjoy the benefits of timeliness (Tinker & Fouse, 2009), high accessibility (Duggan, Ellison, Lampe, Lenhart, & Madden, 2015), improved usability – e.g. multi-media – (Fischhoff, 2012), cost effectiveness (Thackeray et al., 2012; Trouten, 2013), high scalability (Glasgow et al., 2006), and high message fidelity (Snyder, 2001). In addition, social media provides some unique advantages that would potentially help to improve food safety communication. First, social media is widely adopted and has very high user engagement, especially among younger groups, and increasingly among older consumers as well (Pew Research Center, 2015b, 2015c). Thus, social media may help food safety communication reach a broader audience, including previously hard-to-reach populations (Brenner, 2013; Chou, Hunt, Beckjord, Moser, & Hesse, 2009; George Ettl Iii, Ettl, Wilson, & Meola, 2012; O’Keeffe & Clarke-Pearson, 2011; Ramanadhan, Mendez, Rao, & Viswanath, 2013). Second, social media is widely used in health and risk communication (CDC, 2012a; Pew Research Center, 2015a) and has proven to be useful (Tinker & Fouse, 2009) and powerful in prompting changes in users’ health behaviors (Mou & Lin, 2014; Wantland, Portillo, Holzemer, Slaughter, & McGhee, 2004; Webb et al., 2010). Third, social media has great potential in improving transparency, engaging audiences, and building relationships because of its interactive and participatory nature

(Bekkers & Homburg, 2005; Chun, Shulman, Sandoval, & Hovy, 2010; Vorvoreanu, 2004, 2006, 2008a).

Recognizing the potential, efforts to use social media have been increasing (Harris, Mueller, & Snider, 2013; Thackeray et al., 2012), but they have not always been fruitful (Ma, Almanza, & Ghiselli, 2015). This is partly because consumer preference and expectation, especially regarding media, are not clearly understood. In understanding consumer media preferences, it is perhaps more valuable to explore the reasons for the preferences. To study consumers' priorities in evaluating a media, it is important to note that characteristics of other communication components such as information (e.g. timeliness) and source characteristics (e.g. trustworthiness) can all play important roles in consumer evaluation and later selection of a media (Al-Qeisi et al., 2014; Aladwani & Palvia, 2002; Barry & Schamber, 1998; DeLone & McLean, 1992; Frighetto & Wolf, 2014; Hanafi et al., 2009; Huang & Benyoucef, 2013; Krikelas, 1983; Kuhlthau, 1991; Park & Lessig, 1981; Tversky & Kahneman, 1973; Wixom & Todd, 2005; Young & Von Seggern, 2001). Thus, this study incorporated the most commonly cited media, information, and source characteristics (see Chapter 2 for a complete list) and adapted them to the context of foodborne illness outbreak communication to frame consumers' priorities in media preference and selection. These characteristics include: accuracy, timeliness, trustworthiness, applicability/saliency, interactivity, searchability, usability, linkability, familiarity, and security. The following research questions were examined.

1. What is the preferred media for consumers to obtaining foodborne illness outbreak information?

2. What are the priorities for consumers in their media selection?

3.3 Materials and Methods

An online questionnaire was used to capture consumers' responses in five areas related to foodborne illness outbreak information: 1) current usage of information, 2) preferred media type to get information, 3) preferred Internet platform for information, 4) priorities in media selection, 5) demographic information.

A foodborne illness outbreak scenario was used to frame the questions. The participants were given a scenario in which there was a foodborne illness outbreak in their area, a number of people became sick and many of those were hospitalized. Additionally, information such as suspected foods was given to strengthen relevancy and make the scenario more believable ("likely foods were thought to be chicken, lettuce, ground beef, or possibly dairy products, including ice cream"). Then participants were asked to evaluate different communication media options (e.g. Internet and TV) and Internet-based platform options (e.g. social media and websites) in the process of selecting a restaurant to visit.

Content experts with the communication, hospitality industry, and health inspection experts were utilized to develop the questions and response choices. The questionnaire was revised, refined, and finalized after two rounds of pilot testing. Text entries were allowed to provide the opportunity for additional responses. Upon IRB approval, the researchers distributed the survey to U.S. participants through an online company (mTurk). This provided access to U.S. consumers across the nation. On average, the

survey took each participant 15 minutes to complete (upon completion, each participant received a \$0.50 payment). A total of 405 responses were collected in January 2016. If responses were from the same IP address, used the same mTurk worker ID, were from outside the U.S., used repeating mTurk code, or completed the questionnaire in less than 5 minutes, they were excluded from the analyses. After cleaning, a total of 370 usable surveys were analyzed using SPSS version 23. Not all respondents answered all questions.

3.4 Results

The demographic characteristics of the participants were summarized in Table 3-1. In this study, there were more females (58.0%) than males (41.9%). A little more than half (58.8%) of the participants were between the ages of 18-39, which is greater than the U.S. population as a whole as indicated in the 2012 census data (given in parentheses in Table 3-1). This might be because the data were collected online and younger populations are more likely to be online. Because of the age distribution of the participants, more than half of the participants (58.7%) did not have children. Regarding education, 47% of the participants had less than a bachelor's degree, 35.2% had a bachelor's degree, and 17.8% had degrees higher than a bachelor's. Overall, the respondents had more education than the population as a whole. Participants' residential areas were comparable with the census data.

Table 3-1. Profiles of Respondents (n=370)

Characteristics	n	%	Characteristics	n	%
<i>Gender</i>			<i>Education</i>		
Male	118	41.9 (49.2)	Less than Bachelor's Degree	132	47.0 (70.7)
Female	163	58.0 (50.2)	Bachelor's Degree	99	35.2 (18.9)
			Higher than Bachelor's Degree	50	17.8 (10.4)
<i>Age</i>			<i>Residential Area</i>		
18 – 29	81	28.7 (18.9)	New England	10	3.6 (4.7)
30 – 39	85	30.1 (17.8)	Mid Atlantic	42	15.3 (13.3)
40 – 49	50	17.7 (19.3)	East North Central	50	18.2 (15.2)
50 – 59	45	16.0 (18.6)	West North Central	22	8.0 (6.6)
60 +	21	7.4 (25.3)	South Atlantic	63	22.9 (19.3)
<i>Household with Children</i>			East South Central	11	4.0 (6.0)
No Children	165	58.7	West South Central	29	10.5 (11.7)
Children under 6 years old	43	15.3	Mountain	11	4.0 (7.2)
Children 6 years old and over	63	22.4	Pacific	37	13.5 (16.1)
Others	10	3.6			

Note: numbers in parentheses are 2012 U.S. census data

3.4.1 Media preference

The Internet is the preferred media for foodborne illness outbreak information (see Table 3-2). To compare consumers' overall preference for each media type, a "preference score" was calculated. Scores were assigned for choices – the media would get 5 points every time someone picked it as their number one choice, 4 points for a second choice, 3 points for a third, 2 points for a fourth, and 1 point for a fifth choice – and then averaged using the number of respondents. Results showed that the Internet received an overall score of 3.62, highest among all medias.

Table 3-2. Consumer media preference based on calculated preference score

Media	Specific Internet-based platform	Preference score
Internet		3.62
	Websites	3.27
	Facebook	2.78
	Twitter	2.09
	Instagram	1.76
TV		3.13
Face to face		2.92
Newspaper, book, magazine, or other printed material		2.81
Phone call or texts		2.52

Note: Assigning 4 points every time someone picked that media (or more specifically platform) as their number one choice, 3 points for a second choice, 2 points for a third, and 1 points for a fourth choice, after which an average was created by dividing by the number of respondents.

Interestingly, while the Internet was the most preferred media for a great number of participants (43%), some consumers ranked it as their least preferred choice (13%).

While having no noticeable difference in demographic characteristics (insignificant t-tests), this group of consumers was particularly concerned about information accuracy and trustworthiness; they felt it was sometimes hard to determine the accuracy and trustworthiness of information communicated over the Internet and preferred face-to-face exchanges.

More specifically, among Internet-based platforms, consumers prefer to use websites to find foodborne illness outbreak information, as 55% ranked websites as their most preferred choice. Among social media sites, Facebook was ranked highest, with 24% indicating it as their most preferred choice. Although Twitter is considered a platform for news releases and timely updates (Chen, 2011; Java, Song, Finin, & Tseng, 2007), it was least often selected as the respondents' first choice (4%). These results were also

observed in the overall preference score calculation. Websites ranked the highest (3.27) followed by Facebook (2.78).

3.4.2 Priorities in media selection

To better understand reasons behind consumer media preferences, participants were asked for their priorities in media selection. ANOVA and post-hoc Tukey comparison results suggest that that criteria used to evaluate Internet platforms/sites carried different weights ($F=186.254$, $p<0.001$). Media, information, and source characteristics were all important in consumer evaluation and selection of a media. More specifically, information quality (accuracy and timeliness) carried the most weight when evaluating an Internet-based platform. The most important media characteristic was that the platform had a search function. See Table 3-3.

Table 3-3. Consumer priorities in media selection for foodborne illness outbreak information

Priorities	N	Mean	SD
Accuracy	315	6.57 ^a	0.97
Timeliness	314	6.27 ^{ab}	1.04
Searchability (e.g. search function)	315	6.00 ^{bc}	1.33
Security - less likely to have a virus	315	5.70 ^{cd}	1.52
Trustworthiness (source)	314	5.57 ^{de}	1.53
Linkability (e.g. links to additional information)	313	5.48 ^{de}	1.42
Security - allows control of privacy setting	313	5.34 ^{def}	1.61
Interactivity	315	5.30 ^{def}	1.67
Applicability/Saliency	345	5.22 ^{def}	1.63
Security - less likely to track user data	314	5.20 ^{ef}	1.63
Security - fewer or no advertisements	315	5.19 ^{ef}	1.60
Enhanced usability - visuals (e.g. pictures and videos)	314	5.02 ^f	1.68
Familiarity	344	4.88 ^g	1.75

Note: Mean is rated by participants on a 7-point Likert scale where 1= not at all important and 7= extremely important.

*Based on multiple group comparison results (Tukey comparisons at $\alpha = 0.05$)

The results suggest that social media may have suffered from mismatch between its offerings and consumers' priorities in selection a media when seeking foodborne illness outbreak information. Social media supports more personalization and interactions, which are considered to be less important, while not providing superior search function, which is considered to be the most important media characteristic. Additionally, social media may also suffer from its limited control over design features. For example, search functions on social media sites are controlled by the social media owners or corporate owners of the sites, so it is very difficult if not impossible to improve the feature.

In fact, many participants commented on their concerns about using social media in gathering food safety information. The most commonly expressed concern was information accuracy. The results were echoed when social media and websites were directly compared using the performance criteria. See Table 3-4. Respondents' perceptions were that the websites performed better for all criteria except one (interactivity). Participants felt that websites, as compared to social media, supported better searchability, provided more timely and accurate information, and supplied more security. And websites particularly stand out as providing more accurate and trustworthy information (78% and 76% more participants indicated that websites outperform social media against the criteria of accuracy and trustworthiness). Social media's major advantage, interactivity, was not rated as important as the other priorities.

Table 3-4. Performance comparisons (social media vs. websites) for foodborne illness outbreak information against consumers' priorities in media selection

Criteria	Platform		Total Responses
	Websites	Social media*	
Accuracy	89%	11%	329
Timeliness	57%	43%	330
Searchability	71%	29%	331
Security	54%**	46%**	331
Trustworthiness	88%	12%	329
Linkability	51%	49%	331
Interactivity	30%	70%	331
Applicability/Saliency	50%	50%	328
Usability	53%	47%	331
Familiarity	54%	46%	329

Note: the percentages represent proportion of participants indicated that website or social media deliver superior performance against each criteria.

* e.g. Facebook, Twitter & Instagram.

** Average of the subcategories of security.

3.5 Discussion

3.5.1 Conclusions and implications

Broader food safety communication may help engage consumers and contribute to an overall improvement in food safety. Results of this study demonstrate the importance of the Internet in food safety communications, particularly related to foodborne illness outbreaks. Despite the great potential of social media, at the present time, website is the preferred platform for communication about foodborne illness outbreaks. This does not mean social media's advantages are not valuable; its potential can be further explored in the future.

Consumer preference for website over social media for foodborne illness outbreak information could be due to a number of reasons. First, social media's potential for

informational use may not be fully recognized by consumers. Consumers currently regard social media as a tool for socializing (2, 18). Furthermore, despite the growth of social media adoption (for example, a number of health departments, such as the New York State health department, are now using Facebook), social media has not been widely used in food safety communications (10, 26). As a result, consumers may not even be aware that food safety information can be obtained through social media.

Second, aside from providing superior performance against 9 out of the 10 important criteria consumers use to evaluate and select a media, websites also appear to better match consumers' priorities in media selection when looking for foodborne illness outbreak information. In fact, 14% to 78% of participants indicated that websites perform better in the three most important priorities consumers have when selecting a media for food safety information. For example, consumers place a high value on a good search function, and websites generally provide better search capabilities (including the use of indexing). Social media, on the other hand, provides superior functionalities in areas that consumers believe to be less important. For example, social media allows great interaction (asking questions and getting responses), while consumers do not particularly value such interaction in their search for foodborne illness outbreak information.

Additionally, social media's support for user-generated content appears to be less valued. Consumers prefer more accurate and trustworthy information from more "legitimate" sources such as government or news companies rather than other users. Third, social media may be overwhelming when trying to quickly locate needed information. In support of these results, Robert and Dennis (39) have suggested that social media can hinder the motivation and the ability to process the information communicated – e.g.

because of high social presence. Fourth, websites may appeal to consumers, as websites are generally perceived to be less likely to track user data; for example, users do not need to “log in” to view information.

Additionally, results of this study suggest that consumers not only prefer to use websites, but they are, to a certain extent, against the use of social media. Consumers indicated that they are not likely to use social media to obtain foodborne illness outbreak information. This may be due largely to social media’s interactive and participative (user-generated content) nature. While this allows collective intelligence to be harnessed, information quality (e.g. accuracy and trustworthiness) in communication over social media cannot be guaranteed. With a pressing need to obtain the most accurate, timely, and specific information, consumers prefer to use a website for their information collection. Thus, despite social media’s other benefits (speed, ease of use, and ability to get more personalized information), it is not the preferred information media. It is possible that social media may be more suitable as a supplement to websites. For example, social media could be used to send updates with links to websites with the most current information – so social media could serve as a “shortcut” that helps to direct consumers to websites with more detailed information.

Consumer preferences for websites may, in fact, be good news in that websites allow more controls over feature availability (e.g. search function) while social media features are largely designed by the holding company (e.g. Facebook designs the look and the search functionality on a Facebook page). Entities interested in communicating foodborne illness outbreak information may better match consumer preferences using

their websites (rather than social media) and potentially have better communication results.

The results of this study have important implications for resource allocation. Agencies that are interested in communicating food safety information, particularly foodborne illness outbreak information, may want to focus their efforts on improving users' website experiences. Most importantly, providing a better search experience to quickly and effortlessly locate needed information should become a priority. Providing an advanced search function that allows targeted searches (e.g. sort by dates, locations, food sources, types of illness, etc.) may be helpful.

Websites, if used appropriately, could provide some functions found on social media sites – especially interactivity. Consumer preferences for more interaction might include: places to offer feedback, sign up for newsletters (which also would increase engagement), and follow updates on RSS feed (which would also build relationships).

Social media may still have potential in food safety communication, but further exploration is needed. Additional research is needed to determine if social media should be used purely as an extension of websites – e.g. posting links to websites – or whether social media could enhance food safety communication beyond what can be accomplished by using websites. From this study, it appears future scholarly efforts may want to focus on studying Facebook's potential in food safety communication. Twitter, despite being argued as a feasible alternative, was not the preferred platform in this study.

The reason for this may be that Twitter has a maximum of 140 words and does not allow detailed information (links are almost always used).

Information quality is highly valued by consumers. This shows that providing high-quality information (information that is accurate, up-to-date, and trustworthy) should still be the most important priority in communicating foodborne illness outbreak information. When information quality is maintained, consumers are flexible about where they get food safety information. This highlights the possibility for entities interested in communicating food safety information to utilize Internet-based platforms, thus reducing costs and saving resources. But this study also shows that a small percentage of consumers are against the use of Internet in seeking foodborne illness outbreak information. This group is highly concerned about information accuracy and trustworthiness, and the Internet presents challenges for them in evaluating the accuracy and trustworthiness of information communicated. This indicates that, although powerful, the Internet may not be considered a complete replacement to traditional media medias. Agencies may want to use the Internet as a supplement or extension to traditional medias.

Additionally, it is important to note that media, information, and source characteristics all influence consumers' usage of information. This shows that while the communication media has a great impact on communication outcomes, simply improving media functionalities probably will not yield the best results. Information quality has to be maintained or improved before better media functionalities can produce improved communication outcomes.

Moreover, it appears that the line between source and media is somewhat blurred in the minds of consumers (news sites, for example, appeared to be viewed as both the source and the media type). To a certain degree, there does appear to be some inseparability of the media and source on the Internet (as compared to traditional news sources that included more print media). Particularly, if the source mainly communicates over Internet-based platforms (for example, msn news [source] on the msn.com website [media]), it becomes even harder for participants to make the distinction between source and media. Entities interested in leveraging the Internet should keep this in mind and be aware that, especially in online communication, the reputation of the information source will influence the media usage, and the ways medias are used will reflect back (positively or negatively) on the reputation of the information source.

Lastly, it appears that it is not necessary to use separate platform communication strategies for different demographic groups, except for the group that is somewhat against the usage of Internet (13% of the participants). While previous studies have suggested the existence of potential individual differences, this study found that individual characteristics had no significant impact on platform preferences (social media vs. website). This may have occurred because social media and websites are both Internet-based platforms. This finding suggests that the use of websites might be sufficient in contacting hard-to-reach populations, such as younger consumers, with food safety information (10). On the other hand, the existence of the group (13% of the participants) that would not want to use the Internet for food safety information indicates the need to maintain traditional medias for food safety communication; the Internet may not be a

preferred platform for certain populations and may be better used as a supplement to other forms of communication.

3.5.2 Limitations

This study is not without limitations. In distributing the survey, the goal was to get a representative sample of the U.S. population, but as seen, the participants are concentrated in the younger age groups. Further, because the data was collected online, the response group may have had more access to the Internet. Additionally, it is possible that consumers, instead of evaluating source and media together, misunderstood the terms and thus did not distinguish between source and media; further investigations are needed.

3.5.3 Future research

First, while the Internet is clearly the most preferred media, the possibility of employing multiple medias should be explored. Additionally, as website was discovered to be the preferred Internet platform, investigation is recommended into how consumers form their perceptions towards a website; for example, what makes consumers perceive information as being accurate and trustworthy and what makes consumers feel the platform is easy to use. In this regard, a qualitative study that observes consumers' actual interactions with a website would be particularly insightful.

Further, it would be valuable to dive deeper into consumers' reasons for their current preferences. For example, why do consumers feel that websites outperform social media against the criteria found to be important to their food safety information seeking? Is it

because the current food safety communication primarily happens on websites, so consumers feel social media would not suit their needs in seeking for information? Or is it because websites provide superior functionalities? Or is it because the reputations of entities using various medias are different?

Lastly, it seems information, source, and media characteristics are, to a certain extent, inseparable in consumers' evaluation and selection of a media, so it would be insightful to examine the relationships among these characteristics and determine how they interact and influence communication outcomes together.

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CHAPTER 4. STUDY 2: HOW CONSUMERS INTERACT WITH WEBSITES TO
OBTAIN FOOD SAFETY INFORMATION: AN APPLICATION OF WEBSITE
EXPERIENCE ANALYSIS (WEA)

The following study will be submitted to a peer-reviewed journal and is included in this non-traditional thesis/dissertation as chapter 4. This article is written in the APA style format.

4.1 Abstract

Food safety communication is essential in protecting public health. But the role of the media has been largely overlooked in food safety communication studies. This study utilized Website Experience Analysis (WEA) and examined how website characteristics are linked with users' perceptions. Oregon's health department website was examined by participants who then answered questions about their website experience addressing key efficacy perceptions. The data indicate that several website features are related to both information and media characteristics, and were experienced by users as important and influential in their perception and later behavioral intention formation. Additionally, this study illustrates the utility of WEA for online food safety communication research.

Keywords: food safety, Internet communication, food safety communication, WEA, efficacy, website features

4.2 Introduction

Websites are excellent platforms for communicating food safety information, particularly about foodborne illness outbreaks. Websites have unique characteristics, such as interactivity, speed, and relatively low cost; these make them very attractive as a media food safety communication. With 59% of the United States adult population going online for health information (Pew Research Center, 2015a), the use of websites to communicate food safety information seems appropriate. Unfortunately, websites' potential for food safety communication has not been realized (Choi & Almanza, 2012; Ma et al., 2015).

Media's role has been largely overlooked in food safety communication. Research has focused on adoption scope and content posted (Bortree & Seltzer, 2009; Chapman et al., 2014; Harris et al., 2013; Thackeray et al., 2012). Better utilization of websites to communicate food safety information can only be accomplished if user-website interactions are better understood. The purpose of this research is to utilize Website Experience Analysis (WEA) to examine user experiences and link website characteristics with users' perceptions to improve understanding of food safety communication.

4.3 Literature Review

4.3.1 Food safety communication

Foodborne illness outbreaks can be devastating to the economy, society, and businesses. The Centers for Disease Control and Prevention (CDC) estimated that one in six Americans (48 million) gets sick annually, 128,000 are hospitalized and 3,000 lose their lives because of foodborne diseases (CDC, 2014a). Food Safety News suggests that foodborne illnesses cost the economy more than 15.6 billion dollars each year (Flynn, 2014). Even one foodborne illness outbreak can damage a company's reputation so that it will never fully recover (Seo et al., 2014). Almost three decades after their own *E. coli* outbreak, the stock of Jack in the Box still suffers a price drop whenever an *E. Coli* outbreak happens (Seo et al., 2014).

Communication of food safety information can be powerful in combatting foodborne illness outbreaks as communication can not only change consumer behavior (Choi et al., 2011; Porucznik & Royal DeLegge, 2013), but also improve food safety control (Almanza et al., 2002; Jin & Leslie, 2002). Traditionally, food safety communication has had limited reach and impact (Charles & Lawrence, 1990; Dutta-Bergman, 2004). Newer communication platforms, especially Internet-based platforms, present new possibilities in food safety communication. Few studies have explored these possibilities. Studies have shown that Internet platforms such as social media are starting to gain popularity among health departments (Avery et al., 2010; Harris et al., 2013; Thackeray et al., 2012) and other organizations such as the CDC, the US Food and Drug Administration (FDA), the World Health Organization (WHO), and the American Public Health Association

(APHA) to communicate public health information (Heldman, Schindelar, & Weaver, 2013). But these studies primarily focused on examining social media's adoption and usage based on contents posted online (using traditional methods such as content analysis).

4.3.2 Information seeking

In the literature of information-seeking behaviors, the models of Wilson (1981; 1999), Ellis (1989, 2005), Krikelas (1983), Kuhlthau (1991), and Marchionini (1995) are probably the most cited. Some models such as those by Ellis were tested to be relevant and robust in electronic contexts, particularly in user Internet behavior studies (Marchionini, 2008; 2003; van Deursen & van Dijk, 2009).

Although these models take different approaches, some dimensions consistently emerge as critical in understanding the ways users seek information. All models consistently include dimensions related to interface, including the rules and mechanisms for accessing the information, as well as the quality and quantity of content. This highlights the importance of both media and content in the online information-seeking experience.

Food safety communication has been moving online. The CDC, during the 2009 *Salmonella typhimurium* outbreak associated with peanut-containing products, effectively engaged social media platforms to disseminate information and manage public outrage and panic (CDC, 2012a).

In food safety and health communication, the characteristic of trustworthiness has a huge impact on communication outcomes (Eysenbach, Powell, Kuss, & Sa, 2002).

Additionally, increasing Internet usage has amplified the need for high-quality information (Moorhead et al., 2013; Rutsaert et al., 2013). The Internet has also changed how people obtain general information about food. For example, Internet sites such as Yelp and Tripadvisor have influenced where many people want to go for a meal (Gregory & Kim, 2004; Parikh, 2013; Resnick, Zeckhauser, Friedman, & Kuwabara, 2000).

Although the Internet holds great potential for food safety communication, there is a gap in the research on how to best provide food safety information. Thus, this study focuses on both information and media characteristics in order to better understand food safety communication. Improvements in food safety communication require a good understanding of the mechanisms influencing individuals' information-seeking behaviors and how website features, such as the information or media characteristics, link to uses perceptions.

4.3.3 Website Experience Analysis

Website Experience Analysis (WEA) was created to explore users' experience and interpretation of websites. WEA shifts the focus from the content posted on a website to a user's experience using the website. The reasons for adopting a user-centered approach are grounded in communication theories. Meaning is not embedded in the text, waiting to be discovered by users. Meaning is created in the process of reading and interacting with the website (Fish, 1980). Thus, analyses based on texts (such as content analysis) should

be replaced by observation and analysis of people's experience and perception/attitude changes while using and interacting with the platforms (Vorvoreanu, 2004).

WEA requires participants to examine a website and answer questions along the way about their experience (Vorvoreanu, 2008b). The format of the questions was derived from Prominence-interpretation Theory (Fogg, 2003). Prominence-interpretation theory states that evaluation and usage of a website, credibility assessments in particular, are influenced by the prominence of website elements (if the elements are noticed) and the interpretation of such elements by users. WEA allows questions to be asked that will not direct the participant's attention to certain website elements, but rather focuses questions on user's perceptions; this way, both preeminence and interpretation can be assessed. And this is perhaps the biggest advantage of WEA – the ability to map and link website elements to users' perceptions.

In this study, four perceptions were assessed: self-efficacy, response efficacy, process efficacy, and information efficacy. In applying WEA, a pair of questions is used for each type of efficacy. The first question asks participants to provide a numeric rating for their perception about that efficacy. The second question asks for website elements that the perception is based upon. For example, the pair of questions used for self-efficacy was: "Do you feel you are able to locate the needed information?" (on a scale of 1-10, with 1 = not at all and 10 = very much); and "What on the website makes you feel this way?" (open-ended question).

4.3.4 Efficacy perceptions

Efficacy is a core perception that is predictive of communication outcomes including attitudes and behaviors. Self-efficacy can be defined as one's belief in one's ability to accomplish tasks and achieve a desired outcome (Bandura, 1977, 2010; Witte & Allen, 2000). The concept of self-efficacy has appeared widely in communication literature such as the Health Belief Model (Schiavo, 2014), Protection Motivation Theory (Maddux & Rogers, 1983; Rogers, 1975), and the Extended Parallel Process Model (EPPM) (Witte, 1992). Self-efficacy was also empirically tested and found to be influential in determining communication outcomes (Maloney et al., 2011; Webb et al., 2010; Witte & Allen, 2000). Another important concept in predicting communication outcomes is response efficacy. Response efficacy represents one's belief that a certain action will be effective. While self-efficacy is concerned with how competent we feel, response efficacy is whether we think our actions can lead to the desired results (Floyd, Prentice-dunn, & Rogers, 2000). Response efficacy also has been studied extensively, and its importance is well established (Witte & Allen, 2000).

Following previous literature, self- and response efficacy were adopted in understanding consumer interaction with websites. In the context of this study (food safety communication), self-efficacy and response efficacy were defined as one's belief in his or her ability to find the needed information and the extent to which one believes that looking up information will help to reduce the risk of getting sick. Here response efficacy is assessed after message exposure, which is slightly different from its traditional

applications. In its original form, response efficacy is widely used in understanding message components, which is why it is defined as one's belief that a recommendation action (e.g. washing hands – usually embedded in the message) will reduce risks (e.g. prevent illness). But along with development and advancement of EPPM, response efficacy has been extended and applied in a wide range of contexts such as assessing attitudes towards an action (Barnett et al., 2009) and predicting behaviors (Hullett & Witte, 2001; Roberto & Goodall, 2009). Thus, this study assesses one's belief in whether looking up information will help to reduce the risk of getting sick.

It is without doubt that Internet communication tools have changed individual's information-seeking process, but such impacts can be mixed. On one hand, the Internet allows the information to be more accessible, reducing the efforts required to obtain the information; but on the other hand, the quality of information has increasingly become a concern as anyone can share information online. As noted by Marchionini (2008), digital technology "changes the very nature of information and how people interact with each other and with information." Thus, it only seems reasonable to look at interactions among information, people, and technologies. In this sense, it is important to examine how the media (e.g. website) and the information intermingle and influence consumers' information-seeking behaviors. When it comes to media selection, the Principle of Least Effort (PLE) suggests that information seekers prefer to use media that requires the least amount of effort or is easiest to use (Case, 2005). In understanding information's influence, Diffusion of Innovation Theory (diffusion theory), although initially designed to examine adoption of technological innovations, can be extended to study information-

seeking behaviors (Lajoie-Paquette, 2005; Rogers, 2003). In essence, diffusion theory highlights the phenomena that perceived relative advantages and disadvantages or the perception of value and usefulness of information is the determinant in individual's information seeking behaviors. But these perceptions towards media and information cannot be fully captured by self- and response efficacy. Thus, to conceptualize people's perceptions towards media and information beyond what can be accounted for by self- and response efficacy, this study uses two concepts - "process efficacy" and "information efficacy" to represent the impact of media and information in an individual's information-seeking experience. More specifically, process efficacy is defined as one's belief that the process can be easily done, and information efficacy is defined as one's belief that the information will be helpful. In sum, this research focuses on four dimensions of efficacy perception: self-efficacy, response efficacy, process efficacy and information efficacy in studying people's information seeking behavior.

With these in mind, this study attempts to address two research questions: 1. How do consumers get foodborne illness outbreak information? 2. What website characteristics are experienced by consumers that influence their efficacy perceptions (response, self, process, and information) towards the communication?

4.4 Methodology

4.4.1 Website selection

WEA is "very well suited for examining a single website with the purpose of understanding and improving the experience of using it" (Vorvoreanu, 2008b). A health

department website was selected for this study because health departments are perfectly positioned to communicate information about foodborne illness outbreak (e.g. have more localized information than CDC), and in fact, have the primary responsibility for identifying and investigating foodborne illness outbreaks (Lynch, Painter, Woodruff, & Braden, 2006). After examining the websites of numerous health departments, Oregon was chosen because it is comparatively competent in using website for foodborne illness outbreak communications. The State of Oregon health department is one of six Integrated Food Safety Centers of Excellence that were established through a competitive process to improve foodborne illness surveillance after the Food Safety Modernization Act (FSMA) came into effect. The six selected state health departments can be considered highly competent in foodborne illness surveillance and investigations. Among the six centers - Colorado, Florida, Minnesota, New York, Oregon, and Tennessee (CDC, 2015b), Oregon was chosen because it is the only one that currently posts updates on ongoing foodborne illness outbreaks (the latest post was within the last three months). In addition, lessons learned from this website analysis would be expected to provide an exemplar for other health departments as they are based on an actual model of a health department website.

4.4.2 Sample selection

In using WEA, it is highly desirable for the samples to be homogenous – that is, the participants are members of the same public/interpretive community (Fish, 1980; Machor & Goldstein, 2001; Vorvoreanu, 2006). While WEA can be conducted with different publics, it is important to know that the experience of each public can be different using the same website. Research has suggested that age may influence individuals' usage of

the Internet and their perception of the usefulness of Internet-based services (Jones, Cassie, Thompson, Atherton, & Leslie, 2014; van Deursen & van Dijk, 2014; Zickuhr & Madden, 2012). The targeted populations, in terms of age, are younger adults (18-29) and young adults (29-40). The reason for this decision is the Internet leverages the most value when communicating food safety information with younger and young adults. These two age groups are historically hard-to-reach population groups in health communication (Gray, Klein, Noyce, Sesselberg, & Cantrill, 2005), but because they frequently use the Internet for information (Pew Research Center, 2010, 2015b), using Internet platforms for food safety communication has great potential to reach these populations.

Additionally, the level of education may influence individuals' digital skills and thus influence how they interact with websites (Katz & Aspden, 1997; van Deursen & van Dijk, 2014). With this in mind, a quota sampling strategy was applied using age and education level as strata. For each of the subgroups (e.g. age 18-25, with a bachelor's degree or more), four participants (Vorvoreanu, 2008b) were recruited. See Table 4-1.

Table 4-1. Sample distribution based on age and education

<i>Age</i>	<i>Education</i>	
18-28	Bachelor's and above (4)	Less than Bachelor's (4)
29-40	Bachelor's and above (4)	Less than Bachelor's (4)

To collect data that includes a range of ages and education levels, two different settings, a public library and a university campus, were utilized. A pre-participation survey was then utilized to capture potential participants' ages and education levels. In total, 16 participants were recruited (see Table 4-1 for the distribution).

4.4.3 Procedures

During each one-on-one research session (around 40 to 60 minutes), participants were asked to describe their typical behaviors in getting foodborne illness outbreak information. Participants were then asked to look for information about a recent foodborne illness outbreak using the State of Oregon's health department's website and answer pairs of questions addressing the four efficacy perceptions (response, self, process, and information). In each pair, the first question asked a numeric rating for the efficacy perception while the second, open-ended question asked participants to explain what website aspects accounted for their opinion and perception. To ensure all participants' experiences were identical, the cookies and temporary Internet files were all cleaned after each data collection session. Recurring themes were identified in the responses to each open-ended question, and the answers were thematically coded for the presence of these themes.

4.5 Results

Of the 16 participants whose responses were recorded and analyzed, 8 were female and 8 were male. Overall, all participants had quite a lot of experience using both computers (M= 14.375 years) and the Internet (M= 14.125 years). Participants reported having used computers for 8-30 years, and the Internet for 8-30 years. All participants reported using computers and the Internet frequently, at least once a day.

4.5.1 Two-stage process in seeking out foodborne illness outbreak information

When asked to describe their typical information behavior regarding foodborne illness outbreak information, 14 participants indicated that they do not look for foodborne illness outbreak information regularly. The other two participants, who both happen to fall in the group age between 29-40 with a bachelor's degree or above, indicated that they sign up for newsletters from different agencies, including CDC, Food Safety News, and FDA, for updates about foodborne illness outbreaks. Participants' information needs to get regular foodborne illness outbreak updates corresponded to their interest and concern for food safety. Individuals who were more interested in and concerned about food safety received updates on outbreaks regularly; while the rest of the participants were more passive consumers of information. They received foodborne illness outbreak information along with other news, and they did not have a particular interest in getting regular updates. One participant made a comment to illustrate this point: "If there's something happening that is serious, I will see it in the news. If it is not on the news, I think it is not to the point for me to be concerned."

On the other hand, all participants indicated that once they became aware of an instance or outbreak, they would look for more information if the event was personally relevant (e.g. geographically relevant and ongoing). "If it is happening in my area, like in the restaurant I know of, I will definitely look for more information." This suggests that a risk is only perceived if there's an ongoing and relevant (personal risk) outbreak and only when a risk is perceived is the need for information generated.

Individuals have different ways of becoming aware of an outbreak. The people who were more concerned had signed up to receive regular updates (e.g. newsletters), but the majority of respondents passively waited for the information to be pushed to them (e.g. through TV, newspapers, or social media updates). To learn about if there's an outbreak, a number (8) of participants indicated that social media was their most preferred way of getting updates, followed by phone applications (4), TV (3), and radio (1).

After learning that there's an outbreak, the uncertainties and potential risk presented create a drive or need for information. And this drive motivates individuals to seek out more information to reduce the uncertainties and protect themselves. In seeking more information, all participants indicated that they would start with a search engine (e.g. Google, MSN, or Yahoo) and not go to a specific website for information. The reasons for this are that participants feel search engines provide more up-to-date information that is directly related to the topic of interest. In addition, search engines provided a list of sites individuals can select from. So with the least amount of effort, search engines provided a "comprehensive" list, within which at least one site would likely be able to supply useful information. Additionally, younger participants (both groups ages 18-30) were more likely to use smart phones instead of computers when they wanted to look up additional information.

4.5.2 Mapping perceptions to website characteristics

Self-efficacy

The first pair of questions, “Do you feel you are able to locate the needed information?” and “What on the website makes you feel this way?” were used to address self-efficacy perception. On average, the participants gave self-efficacy a score of 6.7 (out of 10). The main website feature that participants indicated as important for them in formation of the self-efficacy perception was information organization, including the use of site a map, tabs, and structural highlights. The participant’s comments (along with a screenshot, Figure 4-1) illustrates the importance of an information organization structure:

The website is very organized. It has multiple colored tabs with different topics... this structure, with the row representing topics and the column representing services. I feel that I can find the information I need here.

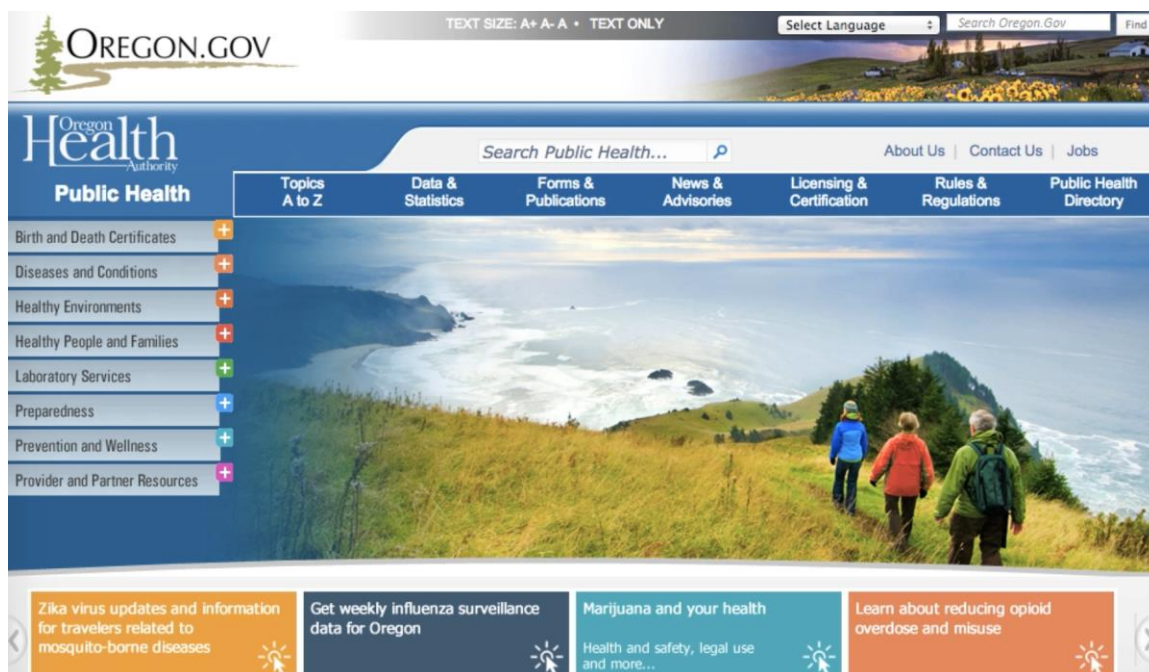


Figure 4-1. Screenshot of Oregon state health department website illustrating participant comments on information organization

Another important website feature that emerged from participants' comments was the links on the website. This is somewhat related to the organization of the website, yet it is specifically mentioned by multiple participants (see figure 4-2).

I feel these links help me to find the needed information.

The screenshot shows the Oregon Health Authority website. The main navigation bar includes 'Public Health', 'Topics A to Z', 'Data & Statistics', 'Forms & Publications', 'News & Advisories', 'Licensing & Certification', 'Rules & Regulations', and 'Public Health Directory'. The 'News and Advisories' section is active, with 'Food Safety Alerts' highlighted. The main content area is titled 'Food Safety Alerts' and contains several paragraphs of text, a 'Food Safety for the Public' section with social media links, and a 'Food Recall Information' section. A 'Public Health Division Food Safety Alerts' section lists recent outbreaks: 'Norovirus outbreak connected to Yaquina Bay oysters 02-24-2016' and 'Multistate Salmonella Outbreak Linked to JEM Raw Brand Nut Butter Spreads 12-03-2015'. A 'Media Tools' sidebar on the right includes 'Media Contacts', 'Records Requests', and 'Sign up for Public Health Division Alerts'.

Figure 4-2. Screenshot of Oregon state health department website illustrating participant comments on the use of links

One other important website aspect related to self-efficacy was specificity of information.

When information on the websites was very specific, participants were more confident that they could find the information needed.

I am disappointed that a lot of the information is just too general. I am not sure if I will be able to find what I need.

The last important theme to emerge was that self-efficacy was influenced and possibly more heavily by pre-existing beliefs that would not be changed directly by interacting with the website. These pre-existing beliefs included one's confidence in his or her ability to use Internet-based applications and one's existing feeling towards food safety communication platforms.

Even if you give a very crappy website, I can still find what I need... I use the Internet every day for my work.

Even though this website looks really good, I know websites like this normally do not work as well as they appear to be. So, I don't know if I can find the needed information.

Response efficacy

The next pair of questions asked participants the extent to which they believe that looking up information on this website will help to reduce the risk of getting sick and what website characteristics made them feel that way. The specific questions were: "Do you feel that looking up food safety information will help you reduce the risk of getting sick?" and "What on the website makes you feel this way?" Overall, all participants give an average score of 7.0 (out of 10) for response efficacy.

One important theme related to response efficacy was the breadth of information provided. The participants indicated that using a website that provides a wide range of information will make them trust the information more and thus feel a stronger connection between looking up information and staying healthy.

This website provides a lot of information covering a number of different topics. I feel that if they can put up so much information, they must be the experts in this. And because I will trust them more, I feel that looking up information on this website will help me stay healthy.

Another theme that emerged related to response efficacy was the visual aspects of the website. Instead of an element, this feature is users' interpretation of visual presentations on the website or visual esthetics. Attractive graphics, coordinated colors, and visually appealing designs can all be considered as important aspects of visual esthetics.

The picture looks very happy and makes me think that they care about our welfare. All the different colors they use are coordinated and not too overwhelming, so I feel that they put in efforts in making this website look nice... I trust the information more.

It is interesting to note that most website characteristic emerged here are related to trust in the website. Belief that looking up information will help to reduce the risk of getting sick may in fact be a trust issue. Further investigations are needed before any affirmative conclusions can be reached.

The final major theme related to response efficacy was that although website characteristics were important, experience with the website alone would not determine users' perception of response efficacy. Response efficacy is also influenced by factors such as existing knowledge, previous experience with information, and confidence in one's health that are outside the interaction with the website.

They lay out things very nicely and clearly for me to see... But I don't know much about this *E.coli* thing... I am not sure if this information will protect me.

I really don't think anything on this website changes my opinion. I would totally still look for information if I know there's an outbreak.

Process efficacy

The third pair of questions was intended to gauge users' process efficacy perception and the reasons behind their perceptions. Two questions were used: "Do you feel that the process of locating needed information is easy?" and "What on the website makes you feel this way?". The average score for process efficacy from all participants is 5.1 (out of 10).

The presence of a search box is the most important feature related to process efficacy, as 100% of participants touched upon this aspect.

Having a search box makes it so much easier for me to find the information I need.

However, 14 out of 16 participants mentioned that the search experience was not satisfactory, which is probably why the average score for process efficacy is comparatively lower. The major problems included: the search results cannot be organized according to different criteria (such as time posted), the search function does not fully support the use of keywords, redundant layout (e.g. multiple search boxes close to each other, see Figure 4-1), and inability to refine searches.

I cannot sort accordingly to time.

When I typed “food borne illness outbreak” in the search box, no results were found.

There are two search boxes? ... I will just go ahead and use one and see what happens.

The first five links are all about inspections, educational, and training materials...I cannot filter out the non-relevant stuff and only focus on news updates of outbreaks.

The second website feature experienced by participants as important to process efficacy was interactivity. And more specifically, interactions with other humans such as different users and the source of information were indicated to be important.

Being able to share this information right from this page makes it so easy to use this information.

I love that there is a comment box... So if I cannot find what I need right away, I can always ask and find out later.

The third feature on a website that was mentioned frequently by participants was the presence of links. The links that direct users to additional information – such as explanations of a concept and references from outside sources – were perceived to make it easy for users to locate needed information.

I can click through these links and easily find a lot of information.

The fourth website aspect mentioned by participants was the use of visuals. Visuals are pictures and videos that facilitate users' understanding of the information presented.

Watching this video really makes it easy for me to understand what was going on.

The pictures really helped me in seeing where the outbreak is spreading.

However, it is important to note that using pictures and videos from a third party site can be risky as security is not guaranteed. To maintain the image that the website is a safe and credible source for food safety information, the pictures and videos need to be carefully curated.

I very much enjoyed watching this video... But after the video is done playing, it links to some other videos that are apparently not 'legitimate.'

Information efficacy

The last pair of questions asked about participants' information efficacy perception and the website characteristics that influence that perception. "Do you feel that information communicated is helpful to you in making dining choices?" and "What on the website makes you feel this way?" were used to assessing information efficacy. The average score for information efficacy was calculated to be 6.9 (out of 10).

The most frequently mentioned theme was timeliness of the information. All participants think current and up-to-date is essential for the information about the foodborne illness outbreak to be useful.

I see that the updates are current... so I feel they can be useful.

The second website aspect that emerged was source. The source directly related to consumer perception of trustworthiness. All participants noticed that the website was a government website and because of this, they perceived it to be trustworthy and credible – and thus considered the information on the website to be more useful.

I trust it ... the information is coming from a legitimate government agency.

The third important theme was information accuracy. To participants, if the information was specific and contained reasonable recommendations, it was perceived to be accurate and thus useful.

The information tells me exactly which brand is involved and which food item is contaminated. I like this. I can totally use this information.

The fourth theme to come out of participants' comments was user orientation, which was reflected in certain interactive features of the websites. User orientation is similar to what in marketing would be defined as customer interest. Participants felt that paying attention to users' needs indicates that a website (and the entity using it) cares about users, and thus the information communicated can potentially be more useful. Two main website features related to individual perception of user orientation were the ability to share information with other users and the capacity to provide feedback, ask questions, and get responses. In other words, interactivity – interaction with other users and the information

source – is highly important for consumers. This website aspect was also mentioned frequently when process efficacy was evaluated.

Mentioned less frequently, but still appearing multiple times, was the website's readability. Here the results were conflicting, while some participants did not appreciate technical terms (at least not without explanations), others preferred the presence of technical terms. But overall, participants all welcomed information that was clearly written and easily understandable.

These professional terms make me feel that they know what they are doing.

I don't have a lot of background in this area... I don't like when they use words I cannot understand.

I like this is clearly written with short and concise sentences... I think it will be helpful.

Other website aspects mentioned by participants, such as no advertisements, were not mentioned frequently enough to be considered major themes. One interesting finding, as mentioned in two participants' comments, was that the quantity of information presented would influence their perceived usefulness of information. However, one participant noted the more information, the better while the other indicated the opposite.

A summary of the linkages between website aspects and user efficacy perceptions were presented in Table 4-2.

Table 4-2. Participant experience map - a summary of efficacy scores and website aspects linked to different efficacy perceptions

Efficacy	Score (Out of 10)	Website aspects linked	Other aspect linked
Self	6.7	Information organization Links Specificity of information	Pre-existing beliefs
Response	7	Breadth of information Visual esthetics	Knowledge, experience, and confidence
Process	5.1	Search box Interactivity Links Visuals (pictures and videos)	
Information	6.9	Information timeliness Source Information accuracy User orientation (the ability to share information with other users and the capacity to provide feedback, ask questions, and get responses) Readability	

4.5.3 Design suggestions

Some design suggestions were also mentioned by participants. First, the majority (14 out of 16) of the participants mentioned that they would prefer an “alert feature” that allows quick grasp of the most recent updates. For example, a pop-up alert on the home page, an easy-to-spot link on the first page (with a different color or otherwise emphasized), or a floating window (which remains in sight when users scroll up and down) would all be possible ways to communicate the most recent updates. Second, to make information

concise is a good practice, but additional features, such as an explanation box, can be used when users hover their mouse over certain difficult-to-understand concepts. Such feature can also be used to explain how some website functions work. Third, making the website mobile friendly seems to be an important consideration as a large number of consumers used their phones for information. Fourth, adding a function for users to enlarge font sizes may be helpful.

4.6 Discussion And Impact

When discussing the implications, it is important to keep in mind the limitations of this study. First, this study utilized younger populations, and there's no evidence that these results could be generalized to all populations. Second, this study utilized one website in data collection. Additional features that are also important may be absent from this particular website and thus not mentioned by participants. In the future, a comparison across different platforms, including both websites and social media could be done to verify the robustness of the results.

4.6.1 Implications for food safety communication practice

The observed information seeking behaviors where individuals become aware of an outbreak, interpret the risks and get motivated to seek information, and use their preferred media to obtain needed information indicates a two-stage process in foodborne illness outbreak information-seeking. The first stage is initial exposure and the second stage is conscious and active information seeking. This means that when drafting communication strategies, two questions needed to be considered: how do you reach broader audiences

when there's an outbreak and how can the information seeking process be improved when consumers are looking for additional information about an outbreak. Social media can be helpful in reaching broader audiences as it can be used to post updates and push outbreak information to consumers (alerting consumers). Social media allows entities to leverage consumers' existing network (e.g. a post can be shared on social media with friends and family) as well as get in contact with younger, previously hard to reach, consumer groups for food safety communication. This means that aside from being a potential vehicle to build relationships with the public (Chapman et al., 2014), social media can be an effective supplement to existing communication channels for foodborne illness outbreaks. Additionally, traditional media (e.g. TV, newspaper, or radio) can also be leveraged at this stage to reach more audience, particularly since the Internet - while covering the majority of the population - is still not accessible by everyone.

As seen, after the initial exposure, consumers look for additional information about an outbreak. During this process, consumers' preferences and needs may shift and thus require a different communication strategy to be implemented. Here, consumers are in need of information to take action and protect themselves, information quality - characterized by trustworthiness, specificity (details), and timeliness - becomes more important. As such, website may become more suitable as social media starts to lose its relative advantages at this stage of communication. To leverage the benefits of different platforms, a strategy that integrates the usage of different platforms may in fact be more appropriate. For example, using social media to post updates and alert consumers about ongoing outbreaks. And use links to direct consumers to websites that contain more

detailed information. In the future, more exploration may be needed to suggest more effective use of different platforms especially the combination of different platforms.

Additionally, it was discovered that, at the second stage, consumers commonly identify the websites for information through the use of search engines. This highlights the need for government and health agencies that are interested in communicating food safety information to the public to do their best to get “found”. Overall, good practices include adding more relevant keywords, providing timely updates, and incorporating links from other trustworthy sources.

Furthermore, individuals only perceive a risk if a foodborne illness outbreak is personally relevant to them. This implies that more localized and timely (e.g. real-time) updates may be needed in communicating about foodborne illness outbreaks. As such, health departments may be uniquely positioned to be the center for communications of foodborne illness outbreaks as they are, in general, more aware of local events and have more specific information for consumers.

It is possible that a user’s interpretation of a website is very different from the intended meaning of website creators. WEA offers an easy way to find out about such potential differences (Vorvoreanu, 2006). Utilizing WEA, three information characteristics – trustworthiness, timeliness, and accuracy, along with three media characteristics – searchability, interactivity, and enhanced usability (including visuals and links) were found to be most important when users form their perceptions towards the website and the information communicated. This has a number of design and website usage

implications. It is important to keep in mind the context when reading and using these design implications. Although insightful, such design observations should be evaluated within the context of this study as participants' reactions were collected utilizing the Oregon state health department's website. Considering these observations as contextual insights, they are not intended for generalization, but rather for understanding consumer experience.

1. It is essential to help users reduce or minimize the efforts needed to look for information. Having a working search function is probably the first thing entities may want to consider. A search function is considered working if it allows users to quickly locate the relevant information when they know little about the outbreak. So features such as 'fuzzy' keyword search, filters allowing information to be ranked by the number of clicks, time, and location, and advanced search supporting use of location service may be valuable to incorporate.
2. Media and information characteristics interact and together create perceptions of efficacy. For example, users derive meaning and make decisions not only based on content elements, but also from the ease of accessing them. Thus, when designing websites for food safety communication, consider carefully how the interaction of content, layout, organization, and navigation can be leveraged. One example is to make the most current updates appear at places that are easily seen, such as the top of the page. Alternatively, entities can use a pop up banner/box to draw users' attention to the most current outbreak updates. Additionally, entities may want to consider

- using a site map such as different colored tabs on the side or at the top of the website to help direct users attention and support quick location of needed information.
3. Because users value interactivity, organizations such as health departments may want to consider inviting the public to communicate with them and with each other. For example, embed functions to share information on the site and provide means such as a comment box for feedback. This way, websites can be used as a vehicle for building relationships and sustaining engagements.
 4. Visual elements are important in assisting users' interpretation of information communicated. When possible, incorporate relevant and visually appealing pictures and graphs on the page and start to use videos. But make sure these pictures and videos are carefully curated so that they do not link to unintended information as in the case of most YouTube videos. Consumers' trust, once broken, is hard to restore. Hosting videos rather than embed from YouTube to avoid unintended recommendations from YouTube, which can quite unpredictable, may be a wise thing to do.
 5. Some meta-communication of website elements should be kept in mind when designing and using websites. Individuals derive meaning and make inferences about the information, the website, and even organization from subtle aspects of website design, such as the colors, the placement/ location of information, and pictures used. Ideally, when setting up a website, a master organization plan, which includes topic organization, color theme, placements of sections etc. need to be thoroughly thought out. Again, it is important to help reduce users' efforts in information seeking. For example, when possible, put the most recent outbreak in an area that is more

noticeable (e.g. on the first page, and at the top of the page) and use color to highlight it. It is advised to avoid assuming that if the information is there, users will find it. Additionally, the conventional meanings of different design elements are good to keep in mind. For example, the color red may signal ‘alert’ and ‘emergency’ while the color green may signal ‘safe’ and ‘good’. Using colors to present the urgency levels of different outbreaks may be helpful.

4.6.2 Implications for food safety communication research

This study is one of the first to demonstrate the importance of user-centered approaches in studying food safety communication problems. Additionally, the results of study suggest that the four efficacy perceptions may not work in a parallel fashion towards communication outcomes. Furthermore, the formation of different types of efficacy perceptions may not be distinct either, as some of the website features influenced more than one of the efficacy perceptions. It is also interesting to note that information characteristics may influence more than information efficacy, and media characteristics may influence more perceptions than process efficacy. For example, interactivity – the ability to share information with others and ask questions of the information source – impacts both information and process efficacy. This further suggests that the relationship between the four efficacy components can be very complex. Thus, it is important, in the future, to further investigate the formation of these efficacy perceptions and examine the relationships between them and how they interact in influencing communication outcomes. Lastly, this study shed lights on the experience of the targeted interpretative communities/ homogenous groups; future research can utilize the research procedures

outlined in this study and expand our understanding on the experience of different interpretative communities (such as older users).

4.7 Conclusion

This study started with the fundamental question of how websites can be better utilized in food safety communication. A user-centered research protocol, WEA was used to link website characteristics with user perceptions. Data collected using the State of Oregon's health department website was presented. The results suggest that individuals go through a two-stage process in obtaining foodborne illness outbreak information. Additionally, this study found the website characteristics (trustworthiness, timeliness, accuracy, searchability, interactivity, and enhanced usability) are associated with four kinds of efficacy (self, response, process, and information). This study also illustrates the value of WEA both in food safety communication practice and research. Lastly, as one of the first attempts to understand the mechanisms behind food safety information behavior, this study presented direction for future research, particularly focusing on recognizing and refining the concepts of efficacy.

4.8 References

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CHAPTER 5. STUDY 3: IMPROVING FOOD SAFETY COMMUNICATION ON
THE INTERNET: INFLUENCE OF MEDIA ON COMMUNICATION
OUTCOMES

The following study will be submitted to a peer-reviewed journal and is included in this non-traditional thesis/dissertation as chapter 5. This article is written in the APA style format.

5.1 Abstract

Although food safety is important, media's role in food safety communication has largely been overlooked. To explore media's role in influencing food safety communication, this study applied five methodological procedures to test the relationships among website characteristics, perceptions towards these characteristics, efficacy perceptions, and behavioral intentions. It was determined that website characteristics, through efficacy perceptions, influence consumers' intentions to use the communicated information. The results suggest that both information quality and the way information is communicated have a significant impact on consumers' behavioral intentions. Website features that directly relate to searchability (e.g. search box and site map) and saliency (specific information about foods and locations involved) were perceived to be most influential and should be considered when designing and using their websites.

5.2 Introduction

Consumers can play an important role in the nation's food safety if they use food safety information in their food decisions. At the same time, a prerequisite to information usage is access to information. With the increasing availability and popularity of Internet-based communication platforms, communicating food safety information online to consumers is an attractive alternative to traditional medias. Online platforms offer high speed (Tinker & Fouse, 2009), high scalability (Glasgow et al., 2006), high message fidelity (Snyder, 2001), low costs (Thackeray et al., 2012; Trouten, 2013), and broader reach (Chou et al., 2009). Nonetheless, challenges remain in leveraging Internet-based platforms in food safety communication. In particular, consumer concern over information quality can limit the utility of online platforms. This study is designed to determine how Internet-based platforms can be used in food safety communication and contribute to the protection of public health.

5.3 Literature review

Food safety communication offers enormous benefits including the protection of public health and improved business operations (Almanza et al., 2002; Choi et al., 2011; Jin & Leslie, 2002; Porucznik & Royal DeLegge, 2013). Traditionally, food safety information has been communicated through push medias that are passive in message delivery, such as TV and newspapers. In fact, the most common outlets for food safety information have been newspapers, television, and radio (Almanza et al., 2003). The major drawback in push communication is that users have few choices about the information they receive

and when, so the information is likely to have low relevancy, resulting in lower information usage. Additionally, the limited reach of traditional food safety communications reduces the impact of communication (Charles & Lawrence, 1990; Dutta-Bergman, 2004). If food safety information was more accessible and the communication was more engaging, consumers would be more likely to use it (Worsfold, 2006). A recent national survey of 5,000 consumers showed that consumers are more interested in food safety and transparency throughout the food system (Food Safety News, 2016). In addition, the Internet is the top choice for consumers seeking food safety information (Charanza & Naile, 2012).

Literature suggests that, once motivated, information quality, source characteristics, and media properties all impact the evaluation and later usage of information, and that information, source, and media characteristics can interact (Barry & Schamber, 1998; Frighetto & Wolf, 2014; Krikelas, 1983; Kuhlthau, 1991; Park & Lessig, 1981; Tversky & Kahneman, 1973; Young & Von Seggern, 2001). Specifically, both information and source characteristics can interact with media characteristics in determining consumer trust and later communication outcomes. No matter which media consumers use, they want to get accurate information, and consumers may perceive information from a health department to be more accurate than information from an individual. Additionally, source characteristics are often directly related to information characteristics.

While the impacts of source and information have been studied (Gordon, 2003; Kornelis, De Jonge, Frewer, & Dagevos, 2007), media's potential contribution in improving communication outcomes has received limited scholarly attention. Overall, within the

context of foodborne illness outbreak communication, the role of media has been largely overlooked. Research has focused on benefits of new media (Chapman et al., 2014; Rutsaert et al., 2014), effect of communication and intervention (Mayer & Harrison, 2012; Mitchell et al., 2007; Powell et al., 2011), and user typology (Kuttschreuter et al., 2014). This lack of research limits scholars' ability to fully explore ways to improve usage of Internet-based communication platforms in food safety communication. To address this issue, this study applies the Extended Parallel Process Model (EPPM) to examine media's role in consumers' food safety information-seeking experience. Additionally, because of the intercorrelations among media, information, and source when examining media effect, this study incorporates information and source characteristics in evaluating media's influence on communication outcome. In essence, this study will attempt to determine the media characteristics, and more specifically the platform features, that contribute to improved foodborne illness outbreak communication outcomes and why.

Studies have suggested that certain website characteristics such as interactivity, usability, trustworthiness, information quantity, security, recency, and accuracy (Aladwani & Palvia, 2002; Coursaris & Sung, 2012; Hanafi et al., 2009; Hsieh, Kuo, Yang, & Lin, 2010; Hsu & Lin, 2016; Klein, 2001; Nelson et al., 2005; Strong, Lee, & Wang, 1997; Wixom & Todd, 2005) are directly associated with users' evaluations and thus satisfaction and usage of a platform. Previous studies (Ma, Almanza, Ghiselli, Vorvoreanu, & Sydnor, 2016a, 2016b) have suggested that the most relevant characteristics regarding source, media, and information in foodborne illness outbreak

communication are saliency (information), timeliness (information), trustworthiness (source), searchability (media), usability (media), and interactivity (media). Thus, this study focuses on three media characteristics (searchability, enhanced usability, and interactivity), one source characteristic (trustworthiness), and two information characteristics (timeliness and saliency). In this study, the most commonly preferred website features from previous studies (Ma et al., 2016a) are used to represent website media characteristics – specifically, search box and site map for searchability, links to outside information and links to pictures and videos for linkability, a function to ask questions and a function to share information for interactivity. See Figure 5-1.

The Extended Parallel Process Model (EPPM) was originally developed to guide message formation in health communications when risks are involved (Witte, 1992). Witte (1992) reintegrated affective process with Rogers's work of cognitive process of fear (1975, 1983), built upon Leventhal's framework of parallel danger and fear processes (1970), and introduced EPPM. EPPM suggests that after exposure to a threat (normally in the form of a fear appeal), an individual develops the perception of threat based on the severity of the threat and the personal susceptibility to the threat. The more severe the situation, and the more susceptible the individual is, the more they are motivated to evaluate the efficacy of the recommended response. Individuals' perceptions of response efficacy (how effective the recommended response is in reducing the threat) and self-efficacy (if they believe they can perform the recommended response) are formed and combined with their perceived level of threat, thereby leading to their response choice. There are three possible outcomes. Individuals can ignore the message if

the threat is perceived to be low or irrelevant (so the efficacy appraisal is not even triggered). Alternatively, individuals can engage in danger control where they process the message and take the recommended actions. This is more likely to occur from a combination of high threat perception and high efficacy perception. Or individuals can engage in fear control when they are exposed to a serious threat without a perceived effective response or they do not believe they can successfully perform the response and avoid the threat. In other words, a high threat combined with low efficacy will trigger danger control. Since its introduction, EPPM has been widely adopted to develop effective risk communication messages, specifically messages that would elicit adaptive behavioral responses (Gore & Bracken, 2005; McMahan et al., 1998). Outside message design, EPPM's applications in assessing attitudes towards an action (Barnett et al., 2009) and predicting behaviors (Hullett & Witte, 2001; Roberto & Goodall, 2009) supports its predicative power in a wide range of contexts.

Health communications are increasingly delivered through digital media (Rice & Atkin, 2012; Vance, Howe, & Dellavalle, 2009). The need to examine Internet platforms as new communication media is pressing. Internet as a media provides unique platform and information characteristics that could enhance communication effectiveness. These platform and information characteristics likely lead to perceptions of information quality – how good the information is – and media usability – how usable the media is (Al-Qeisi et al., 2014; Aladwani & Palvia, 2002; DeLone & McLean, 1992; Hanafi et al., 2009; Huang & Benyoucef, 2013; Wixom & Todd, 2005). With encouragement from Kim Witte (Witte, 2015) to assess the impacts of these unique features, this project used

EPPM with two additional efficacy components – message efficacy and process efficacy (Figure 5-1). Process efficacy was proposed to incorporate media features of Internet platforms, and message efficacy was added to assess information quality. Message efficacy was included in the proposed model because information quality may be experienced differently in the digital communication context. For example, timeliness may mean getting news once per day in traditional media communication, but may be real-time if the communication is happening online. Efficacy definitions and the statements used to evaluate consumers' perceptions of these efficacies are given in Table 5-1.

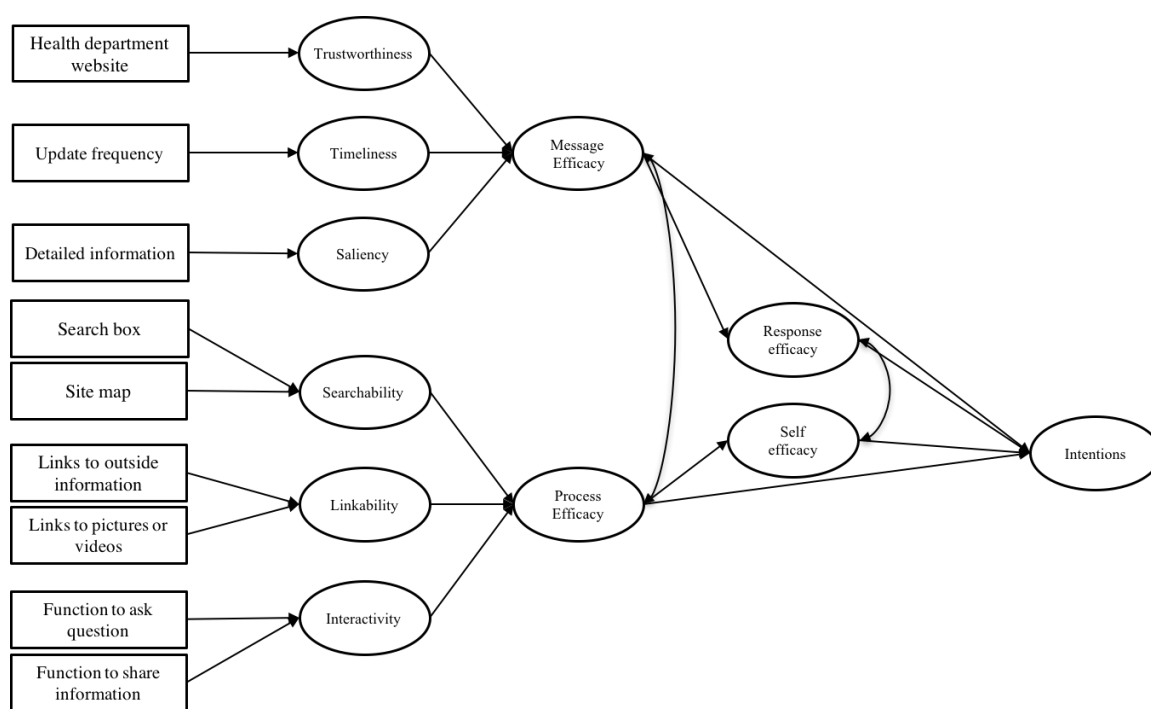


Figure 5-1. Proposed model representing relationships among EPPM constructs and perceptions towards website characteristics in foodborne illness outbreak communication

Table 5-1. Definitions of efficacies and statements used to capture each efficacy perception

Efficacy	Definition	Statements
Self-efficacy	A person's belief that he or she has the ability to find needed information (about foods and restaurants to avoid).	<ol style="list-style-type: none"> 1. I feel I am able to find the information regarding foods and restaurants to avoid on this website 2. I have the ability to locate the information to avoid the foods and restaurants that are involved in this outbreak on this website 3. I am confident that I can find the information to use to avoid the foods and restaurants involved in this outbreak on this website
Response efficacy	A person's belief that using information found reduces the risk of getting sick.	<ol style="list-style-type: none"> 1. I believe that using the information on this website helps to prevent me from getting sick. 2. Using the information that I found on the website protects me during this outbreak. 3. I feel that the use of this website's information reduces my risks of getting sick during this outbreak.
Process efficacy	A person's belief that the process of finding needed information is easily done.	<ol style="list-style-type: none"> 1. I think getting to the information I need is easy on this website 2. I feel the information I need is easily accessible on this website. 3. I feel it is easy for me to find what I am looking for on this website
Message efficacy	A person's belief that the information found is of high quality.	<ol style="list-style-type: none"> 1. I feel the information found on this website is of high quality. 2. I think I find high-quality information on this website. 3. I believe that the quality of information found on this website is high.

In summary, this study examined how various characteristics of Internet platforms influence the perceptions of efficacy in providing food safety information, and the communication outcome. Results were expected to offer practical suggestions to improve food safety communication and advance the theoretical understandings of users' food safety information-seeking behaviors. The following research questions were proposed:

1. How will different Internet platform characteristics (media, information, and source characteristics) contribute to improving food safety communication outcomes (behavioral intentions)?
2. When confronted with a threat, will a higher level of perceived efficacy (including process and message efficacy) improve communication outcomes?
3. Is EPPM useful in understanding food safety information-seeking behaviors?

Hypotheses emerging from these research questions were:

1. Website characteristics (source, information, and media) affect users' perceptions of the website.
2. Users' perceptions related to information quality (trustworthiness, timeliness, and saliency) positively affect message efficacy in experiencing the website.
3. Users' perceptions related to media usability (searchability, linkability, and interactivity) positively affect process efficacy in experiencing the website.
4. Higher perceived message efficacy leads to stronger information usage intention.
5. Higher perceived process efficacy leads to stronger information usage intention.

EPPM predicts that when confronted with a high level of threat, individuals with higher perceived levels of efficacy are more likely to engage in protective behaviors (Witte, 1994). Thus, it is proposed:

6. Higher perceived self-efficacy leads to stronger information usage intention.
7. Higher perceived response efficacy leads to stronger information usage intention.

For individuals, perceived easiness of process in locating needed information will not only influence individuals' information usage intention but also individuals' perceived ability to locate the information (Davis, 1989; Legris, Ingham, & Collerette, 2003; O'Reilly, 1982; Venkatesh, Morris, Davis, & Davis, 2003). Thus, it is proposed:

8. Higher process efficacy perception will lead to improved perceived self-efficacy.

Witte and Allen (2000), in a meta-analysis, have suggested that self-efficacy, to a certain extent, incorporates the idea of "easiness of the process." In other words, how individuals perceive their ability to find the information will impact how process efficacy influences information usage intention. Thus, this study further proposes:

9. Self-efficacy mediates the relationships between process efficacy and consumers' information usage intention.

Information quality will also directly impact consumers' intended information usage as well as their perceived "usefulness" of the information (Davis, 1989; Jingjun, Benbasat, & Cenfetelli, 2013; Legris et al., 2003; Venkatesh et al., 2003). As such, it is hypothesized:

10. Higher message efficacy perception will lead to higher perceived response efficacy.

Additionally, even if the information is good, if it is not useful, individuals may still not use it. Sometimes, information of lower quality can still be useful (Miller, 1996). This phenomena exists in food safety communication as well, the usefulness of the

information can influence the impact information quality has on behavioral intention.

Thus, it was further proposed:

11. Response efficacy mediates the relationships between message efficacy and consumers' information usage intention.

Users generally experience a website as a whole (including information, source, and media characteristics) and form their perceptions and evaluations based on their overall experience. Thus it is hypothesized:

12. Process efficacy and message efficacy covary.

Lastly, in traditional applications of EPPM, self- and response efficacy are often combined to calculate an “efficacy score” (Witte, 1996), so self- and response efficacy are expected to be correlated.

13. Self-efficacy and response efficacy covary.

5.4 Method

5.4.1 Measurement

Because consumers may have varying levels of urgency and continuity for different types of food safety information (restaurant inspection results, food recalls, and foodborne illness outbreaks), this study focused only on foodborne illness outbreak information (FBI). Measures of threat (susceptibility and severity) and efficacy (self-efficacy and response efficacy) were adopted from Witte's RBD scale (1996) and modified to suit FBI

communication. Based on previous research (Ma et al., 2016a, 2016b), three characteristics pertaining to perceived information quality (timeliness, trustworthiness, and accuracy and/or precise detailed information) were assessed. Additionally, three characteristics pertaining to perceived ability to use the media, searchability, enhanced usability, and interactivity, were found to be important (Ma et al., 2016a, 2016b) and thus included in this study. Six specific features that represented searchability, linkability, and interactivity from the previous research study were used to assess perceptions. These included a search box and site map (searchability), functions to share the information with others and allow users to ask questions and provide feedback (interactivity), and links to additional information and to pictures or video (linkability). Behavioral intentions in this study included intentions to use the information on the website in making dining choices in both the short-term and in the long-term. All statements and questions were measured on a 7-point Likert scale.

5.4.2 Data collection

Two stages of data collections were implemented in this study: First, the link between users' perceptions and the presence of different website features was evaluated in order to determine whether the proposed website characteristics created perceptions of high information quality and improved usage experience; second, the hypotheses were tested to examine the ways website features impact communication outcomes. At both stages, surveys were distributed through an online company, Amazon Mechanical Turk (mTurk), to randomly select online participants in the United States.

During the first stage, questions were asked to map out how different levels of website features affected consumers' perceptions. For example, participants were asked to rate their perceived ability to search for information on a website when different levels of search functions (e.g. presence of a search box vs. absence of a search box) were offered on the website. This information is also used in the 2nd stage of data collection to set up the scenarios.

Additionally, the perception of (hypothetical) outbreaks with different severity levels was assessed in stage 1 for their effect on participants' perceptions of threat. Because the number of people sickened and the number hospitalized are often used to characterize an outbreak, this study presented five levels of severity with varying numbers of sick (2, 25, and 100) and hospitalized cases (0, 4, and 17). Two people is the minimum required for an event to be called an outbreak (Delone & McLean, 2003). Numbers of people hospitalized was calculated at 17%, the average percentage of victims hospitalized during many multi-state salmonella outbreaks in the past three years (CDC, 2000).

Salmonellosis is responsible for the majority of hospitalizations among foodborne pathogens (CDC, 2016e).

After validating the importance of the specific website features to the formation of user perceptions in stage one, a self-administered questionnaire was developed for stage two. Following a description of an FBI outbreak, questions were asked regarding threat perceptions (susceptibility and severity). Next, ten scenarios described available website features and information content (each participant received only one scenario) were created. One scenario had all characteristics, 6 scenarios each contained one

characteristic (searchability, linkability, interactivity, timeliness, trustworthiness, and saliency), 2 scenarios were used to capture process efficacy related characteristics (searchability, linkability, interactivity, and timeliness) and message efficacy related characteristics (timeliness, trustworthiness, and saliency), and one scenario where all the desired characteristics were absent.

Following were questions assessed perceptions towards website characteristics, efficacy perceptions (self, response, process, and message efficacy), behavioral intention, and demographics.

5.4.3 Data analysis

Stage 1. A total of 209 responses were collected. After eliminating responses with the same IP address, same mTurk worker ID, high percentage of incomplete answers, or took less than 5 minutes to complete, a total of 195 responses were used for the data analysis. ANOVA tests were used to verify the links between website characteristics and users' perceptions and to facilitate the setup of scenarios used in Stage 2. Data analyses were conducted using SPSS version 23.

Stage 2. Two samples of 211 and 550 were collected (one sample was used for Exploratory Factor Analysis and the other sample was used for Confirmatory Factor Analysis and Structural Equation Modeling). After using the same data cleaning procedure, two samples of 198 and 511 responses were used in the data analysis.

Structural Equation Modeling (SEM) was used to test the relationships among proposed constructs and to understand the mechanism behind the influence of website characteristics on communication outcomes. A two-step approach was adopted to test the measurement model and structural model to ensure the quality of measures (Anderson & Gerbing, 1988). For the first step, confirmatory factor analyses (CFA) were performed and the reliability and validity of the measurement models were examined. In the second step, SEM with a maximum likelihood estimate was performed to identify the relationships among the proposed constructs. Goodness-of-fit (GOF) indices, including χ^2 , root mean square error of approximation (RMSEA), absolute fit indices and normed fit index (NFI), Tucker-Lewis index (TLI), and comparative fit index (CFI), were checked and established to be within the acceptable levels. To test mediation effect, procedures using the Bootstrapping method were carried out (Gunzler, Chen, Wu, & Zhang, 2013; Shrout & Bolger, 2002). All data analyses were finished using SPSS version 23 and AMOS version 23.

5.5 Results

5.5.1 Stage one

There were slightly more females than males, and about 67% of participants were 20 to 39 years old (Table 5-2). About 46% of respondents reported that they had a bachelor's degree or higher and 68.2% had no children. Participants were from all over the nation.

Table 5-2. Profiles of Respondents

Characteristics	Stage 1 of data collection		Stage 2 of data collection			
	ANVOA sample (n=195*)		EFA sample (n=198*)		SEM sample (n=511*)	
	n	%	n	%	n	%
<i>Gender</i>						
Male	95	48.7 (49.2)	78	39.0 (49.2)	203	39.7 (49.2)
Female	100	51.3 (50.2)	122	61.0 (50.2)	308	60.3 (50.2)
<i>Age</i>						
18 – 29	75	38.5 (18.9)	55	27.5 (18.9)	145	28.4 (18.9)
30 – 39	59	30.3 (17.8)	69	34.5 (17.8)	158	30.9 (17.8)
40 – 49	26	13.3 (19.3)	35	17.5 (19.3)	93	18.2 (19.3)
50 – 59	26	13.3 (18.6)	31	15.5 (18.6)	66	12.9 (18.6)
60 +	9	4.6 (25.3)	10	5.0 (25.3)	49	9.6 (25.3)
<i>Household with Children</i>						
No Children	133	68.2	110	55	309	60.5
Children under 6 years old	19	9.7	26	13	67	13.1
Children 6 years old and over	39	20	47	23.5	115	22.5
Others	4	2.1	17	8.5	19	3.9
<i>Education</i>						
Less than Bachelor's Degree	106	54.4 (70.7)	94	47.0 (70.7)	222	43.8 (70.7)
Bachelor's Degree	71	36.4 (18.9)	72	36.0 (18.9)	199	38.9 (18.9)
Higher than Bachelor's Degree	18	9.2 (10.4)	34	17.0 (10.4)	88	17.2 (10.4)
<i>Residential Area</i>						
New England	5	2.6 (4.7)	8	4.1 (4.7)	17	3.4 (4.7)
Mid Atlantic	26	13.4 (13.3)	20	10.3 (13.3)	81	16.0 (13.3)
East North Central	25	12.9 (15.2)	40	20.6 (15.2)	70	13.9 (15.2)
West North Central	5	2.6 (6.6)	13	6.7 (6.6)	34	6.7 (6.6)
South Atlantic	48	24.7 (19.3)	48	24.7 (19.3)	120	23.8 (19.3)
East South Central	17	8.8 (6.0)	6	3.1 (6.0)	22	4.4 (6.0)
West South Central	24	12.4 (11.7)	18	9.3 (11.7)	53	10.5 (11.7)
Mountain	19	9.8 (7.2)	12	6.2 (7.2)	34	6.7 (7.2)
Pacific	25	12.9 (16.1)	29	14.9 (16.1)	74	14.7 (16.1)

Note: numbers in parentheses are 2012 U.S. census data

* Not every respondents answered all the questions

Results showed that there are significant differences among users' perceptions of searchability, linkability, interactivity, timeliness, trustworthiness, and saliency when the different levels of website characteristics were presented (Table 5-3). Hypothesis one was

therefore supported. Results from stage were also used for minor wording changes in stage two to more accurately reflect users' experience.

Table 5-3. One-way analysis of variance for perceptions towards website features/characteristics (n=195)

Perception	Features/ characteristics	<i>t/F</i>	<i>p</i>
Searchability	Search box and site map	624.665	<0.001
Linkability	Links to additional information and links to picture or video	392.512	<0.001
Interactivity	Function to ask questions and provide feedback and function to share with others	497.8	<0.001
Timeliness	Update frequency	192.192	<0.001
Saliency	Names of restaurant and foods specifically mentioned	160.589	<0.001
Trustworthiness	Health department website	46.037	<0.001

5.5.2 Stage two

Descriptive information about participants is presented in Table 5-2. The two samples were similar. Both samples included more females than males, and a little more than 60% of participants were 20 to 39 years old. More than half of the respondents reported that they had a bachelor's degree or higher, and more than 50% had no children in both samples. The participants were from all over the nation.

Manipulation check

Threat. The averages for participants' susceptibility and severity perceptions were 4.54 and 5.31 (out of 7) respectively, indicating that the scenarios generated a perception of threat. Furthermore, 86% of participants indicated that they would look for more information about the foodborne illness outbreak, showing that the scenario successfully created the motivation to seek additional information.

Perceptions towards website characteristics. A series of t-tests indicated that participants perceived different levels (e.g. high vs. low and adequate vs. inadequate) of searchability, linkability, interactivity, timeliness, saliency, and trustworthiness when different website characteristics were presented (Table 5-4) and verified that the links between website characteristics and perceptions towards these characteristics worked as expected and thus demonstrated the manipulations were successful.

Table 5-4. Results of t-test in the manipulation check (n=709*)

	High		Low		Significance t-value
	Mean	SD	Mean	SD	
Trustworthiness	6.07	0.90	2.76	1.40	17.48***
Searchability	6.01	0.98	2.83	1.32	17.01***
Linkability	6.04	0.97	2.19	1.35	20.27***
Interactivity	5.79	1.11	2.13	1.38	18.09***
Timeliness	5.95	1.14	2.54	1.30	17.32***
Saliency	6.05	0.94	2.47	1.38	18.79***

*** $p < 0.001$

Note: Each participant received only 1 scenario.

* The two samples of 198 and 511 were combined here for the manipulation check.

EFA

Exploratory factor analysis (EFA) was conducted to examine the underlying factorial structures. Thirteen factors were extracted based on the theoretical underpinnings discussed before (Appendix 1). The proposed factor structure (Figure 5-1) was supported, with the exception of two saliency items (saliency2 and saliency1) cross loading on timeliness, and two linkability (linkability1 and linkability3) items cross loading on searchability. KMO and Bartlett's test of Sphericity were examined to assess the adequacy of sample. The KMO statistic of .957 for this study fell in the range of being excellent (Hair, 2010); therefore, the sample size of the current study was considered

adequate for factor analysis. Overall, the 13 factors explained 86.61% of the variance; and the internal consistency of items within each construct ranged from 0.770 to 0.975, indicating that the reliability of the measurements was satisfactory, thus it was used later for the CFA analysis.

CFA

Following EFA, a confirmatory factor analysis (CFA) was performed to assess the measurement model as recommended in the two-step approach to SEM (Kaiser, 1974). See Table 5-5. After examining the goodness-of-fit indices for the measurement model, it appears that the measurement model reflected a reasonably good fit to the data ($\chi^2=1387.750$, $df=587$, $p < 0.001$, $\chi^2/df = 2.364$, $NFI = 0.950$, $TLI = 0.965$, $CFI = 0.971$, $IFI = 0.971$, $RMSEA = 0.052$).

Reliability and validity. The reliability of the measurement items was assessed using Cronbach's α . The value of Cronbach's α (internal consistency) for the three constructs ranged from 0.770 to 0.975, exceeding the minimum required value of 0.7 (Hair, 2010). Thus, the level of internal consistency for each construct was considered acceptable. Additionally, Construct composite reliability ranged from 0.850 to 0.959, all exceeded the cutoff value of 0.7 (Hair, 2010), demonstrating internal consistency as well.

To evaluate convergent validity, standardized factor loadings for all measurement items and the average variance extracted (AVE) were estimated. All measurement items had standardized loadings of .5 or higher (ranging from 0.775 to 0.960) and these loadings were all significant at alpha level of 0.001. Further, all AVEs for the constructs (ranging

from 0.653 to 0.908) exceeded the recommended hurdle of .5 (Fornell & Larcker, 1981). These results provided evidence of acceptable convergent validity – the variance extracted by measurement items was greater than variance due to measurement error (Fornell & Larcker, 1981).

Discriminant validity was reviewed by comparing squared correlations between the constructs with the AVE. See Appendix 2 for correlation matrix between constructs. In checking discriminant validity, it was found that two pairs of variables were highly correlated (where at least one of the two AVEs did not exceed the squared correlation). They included searchability and linkability, and searchability and interactivity. This reflects similar problems as observed in EFA, but was somewhat expected as consumers experience the website as a whole and certain features are not perceived alone, separate from other related features. Additionally, previous research (Ma et al., 2016a) suggested that consumers experience functions or features linked to various perceptions differently. For example, consumers used search boxes (linked to perception of searchability) to locate the information more quickly, but used links (connected to perception of linkability) to get additional information. As such, the highly correlated perceptions towards website characteristics were left in the model and path coefficients were examined later.

Table 5-5. Results of confirmatory factor analysis for measurement model

Variables	Standardized loading	P-value	Cronbach's α	Composite reliability	AVE
<i>Susceptibility</i>			0.770	0.850	0.653
I am at risk for getting sick	0.824	< 0.001			
It is likely that I will get sick	0.775	< 0.001			
It is possible that I will get sick	0.826	< 0.001			
<i>Severity</i>			0.903	0.901	0.753
I believe this foodborne illness outbreak is severe	0.855	< 0.001			
This foodborne illness outbreak sounds serious to me	0.883	< 0.001			
I believe that this foodborne illness outbreak is significant	0.865	< 0.001			
<i>Trustworthiness</i>			0.969	0.959	0.886
The trustworthiness of this website	0.915	< 0.001			
The reliability of this website	0.951	< 0.001			
Your trust of this website	0.956	< 0.001			
<i>Searchability</i>			0.960	0.945	0.852
Information searching	0.914	< 0.001			
The ability to look for information on this website	0.932	< 0.001			
This website's "searchability"	0.923	< 0.001			
<i>Linkability</i>			0.956	0.952	0.869
This website's ability to connect you with other sources of information	0.943	< 0.001			
This website's ability to provide you with information from other experts	0.921	< 0.001			
This website's use of links to provide more information	0.935	< 0.001			

Table 5-5 continued

Variables	Standardized loading	P-value	Cronbach's α	Composite reliability	AVE
<i>Interactivity</i>			0.954	0.967	0.908
Ability to interact on this website	0.927	< 0.001			
Ability to communicate with others on this website	0.941	< 0.001			
Ability to exchange information on this website	0.961	< 0.001			
<i>Timeliness</i>			0.956	0.950	0.862
Frequency of the updates	0.922	< 0.001			
The timeliness of this website	0.943	< 0.001			
Currency of the information on this website	0.921	< 0.001			
<i>Saliency</i>			0.962	0.949	0.862
Comprehensiveness of information on this website	0.93	< 0.001			
Adequate amount of information on this website	0.917	< 0.001			
Adequate amount of detail on this website	0.937	< 0.001			
<i>Self-efficacy</i>			0.955	0.944	0.850
I am able to find the information regarding what foods and restaurants to avoid	0.918	< 0.001			
I have the ability to locate the information I need	0.935	< 0.001			
I am confident that I can find information to avoid the foods and restaurants involved in this outbreak	0.914	< 0.001			

Table 5-5 continued

Variables	Standardized loading	P-value	Cronbach's α	Composite reliability	AVE
<i>Response efficacy</i>			0.947	0.939	0.838
I believe that using the information on this website prevents me from getting sick	0.866	< 0.001			
The use of this website's information will help to protect me during this outbreak	0.94	< 0.001			
I feel that the use of this website's information reduces my risk of getting sick during this outbreak	0.938	< 0.001			
<i>Process efficacy</i>			0.975	0.959	0.885
I think getting to the information I need is easy on this website	0.92	< 0.001			
I feel the information I need is easily accessible on this website.	0.951	< 0.001			
I feel it is easy for me to find what I am looking for on this website	0.955	< 0.001			
<i>Message efficacy</i>			0.965	0.953	0.872
The information on this website appears to be good.	0.924	< 0.001			
I think this website has good quality information	0.928	< 0.001			
I believe the quality of information on this website is high	0.946	< 0.001			
<i>Intention</i>			0.917	0.917	0.848
I will use information on this website to make dining out decisions during this outbreak	0.937	< 0.001			
I will use information on this website to make dining out decisions in the future	0.904	< 0.001			
Model fit: $\chi^2=1387.750$, $df=587$, $p < 0.001$, $\chi^2/df = 2.364$, NFI = 0.950, TLI = 0.965, CFI = 0.971, IFI = 0.971, RMSEA = 0.052.					

Structural model and hypotheses testing

The proposed model shown in Figure 5-1 was estimated using Structural Equation Modeling (SEM) with maximum likelihood estimation to investigate the relationship among the proposed constructs — namely, perceptions of threat (susceptibility and severity), perceptions towards website characteristics (trustworthiness, searchability, linkability, interactivity, timeliness, and saliency), efficacy perceptions (self-efficacy, response efficacy, process efficacy, and message efficacy), and behavioral intentions. The goodness-of-fit statistics for the structural model indicated that the proposed model reasonably fit the data ($\chi^2 = 2556.657$, $df = 649$, $p < 0.001$, $\chi^2/df = 3.939$, $NFI = .908$, $TLI = .923$, $CFI = .929$, $IFI = .929$, $RMSEA = .077$). See Table 5-6 for the final structural model results and Figure 5-2 for a graphic presentation of the final structural model estimations with standardized path coefficients.

Table 5-6. Structural parameter estimates and fit indices (n=511)

Path	Standardized estimate	t-statistic	P-value	Relationship
Timeliness → Message Efficacy	-0.181	-3.369	0.001***	Significant
Saliency → Message Efficacy	0.702	10.127	0.001***	Significant
Trustworthiness → Message Efficacy	0.391	9.314	0.001***	Significant
Searchability → Process Efficacy	0.847	5.903	0.001***	Significant
Interactivity → Process Efficacy	-0.071	-0.817	0.414	Not significant
Linkability → Process Efficacy	0.018	0.152	0.879	Not significant
Process Efficacy → Self Efficacy	0.87	29.312	0.001***	Significant
Message Efficacy → Response Efficacy	0.893	29.355	0.001***	Significant
Process Efficacy → Intention	0.044	0.608	0.543	Not significant
Message Efficacy → Intention	0.342	4.08	0.001***	Significant
Self-Efficacy → Intention	0.579	7.606	0.001***	Significant
Response Efficacy → Intention	0.182	2.125	0.034*	Significant
Susceptibility → Intention	0.019	0.453	0.65	Not significant
Severity → Intention	-0.013	-0.319	0.75	Not significant
Message Efficacy ↔ Process Efficacy	0.574	11.704	0.001***	Significant
Self Efficacy ↔ Response Efficacy	0.226	5.614	0.001***	Significant
Goodness-of-fits statistics	Structural Model		Cut-off value	
	Chi-square = 2556.657		N/A	
	Normed Chi-square = 3.939		1.0-5.0	
	NFI = .908		>.90	
	TLI = .923		>.90	
	CFI = .929		>.90	
	IFI = .929		>.90	
	RMSEA = .077		.05-.08 Mediocre fit <.05 Good fit	

Note: *p<0.05,**p<0.01,***p<0.001

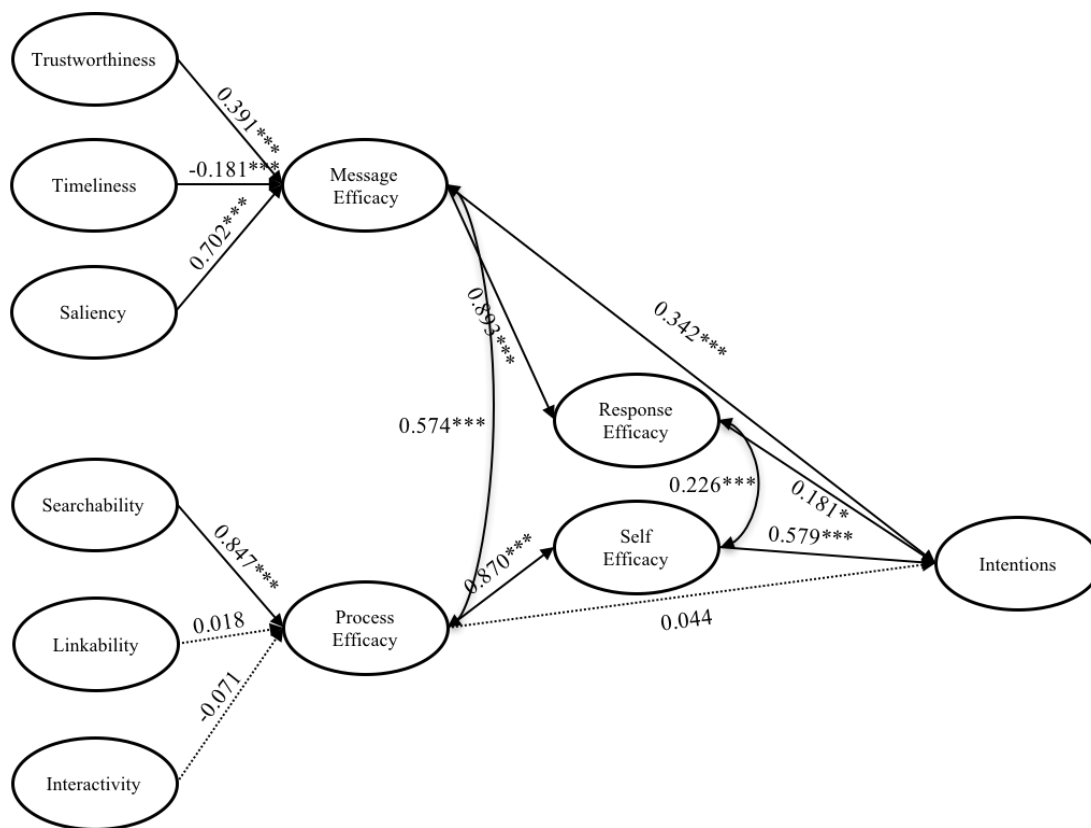


Figure 5-2. Results of the structural model

The results of the structural model indicated that perceptions of trustworthiness ($\beta = 0.391$, $p < .001$), timeliness ($\beta = -0.181$, $p < .001$), and saliency ($\beta = 0.702$, $p < .001$) would all significantly impact consumers' evaluation of message efficacy. However, it is noticed that timeliness negatively impacts consumer perceived message efficacy. Hypothesis 2 was partially supported. Among the three, saliency was identified as the most significant factor that stimulates the perception of message efficacy or that the information is of high quality; 49.28% of variance of the message efficacy construct can be explained by information saliency. This clearly shows the importance of information

saliency. On the other hand, it was surprising to see that timeliness had a negative coefficient estimate, the opposite of what had been hypothesized.

Regarding process efficacy, out of the three proposed and tested perceptions, only searchability had a significant impact, but this impact was considered major as the path coefficient was 0.847 ($p < .001$). Hypothesis 3 was partially supported. This result further suggested that 71.74% of the variance in process efficacy could be accounted for by the perception of searchability, demonstrating the significance of searchability. Neither linkability ($\beta = 0.018$, $p = 0.879$) nor interactivity ($\beta = -0.071$, $p = 0.414$) was a significant predictor of process efficacy. It was surprising to observe that interactivity had a negative influence (even though not significant) on perception of process efficacy.

In terms of relationships among the efficacy perceptions, message efficacy was a strong predictor of response efficacy ($\beta = 0.893$, $p < .001$) while process efficacy was also rather predictive of self-efficacy ($\beta = 0.870$, $p < .001$). When examining the influence of efficacy perceptions on behavioral intention, both self-efficacy ($\beta = 0.579$, $p < .001$) and response efficacy ($\beta = 0.181$, $p < .05$) had a direct impact on behavioral intention.

Hypotheses 6 and 7 were supported. Additionally mediation analyses applying the bootstrapping method were conducted (Gunzler et al., 2013). See Table 5-7. It is seen that process efficacy had a direct impact on behavioral intention ($\beta = 0.461$, $p < 0.001$), but self-efficacy fully mediates this impact. In other words, the relationship between process efficacy and information usage intention drops and becomes insignificant when self-efficacy is included as a mediator. Hypotheses 5, 10, and 11 were supported. Message also had a direct impact on behavioral intention ($\beta = 0.624$, $p < 0.001$) when response

efficacy was not included as a mediator. When response efficacy was tested as a mediator, response efficacy partially mediates the relationship between message efficacy and behavioral intention. This means that response efficacy helps to explain some, but not all of the relationship between message efficacy and behavioral intention. Hypotheses 4, 12, and 13 were supported. See Appendix 3 for a summary of results of hypotheses testing.

Lastly, it was determined that process and message efficacy covaried ($\beta = 0.574$, $p < .001$), as did response and self-efficacy ($\beta = 0.226$, $p < .001$). Hypotheses 14 and 15 were supported. This further indicated that users experience the website as a whole, and even when they form different evaluations of the website (for example, perception regarding information quality – message efficacy, versus perception towards media usability – process efficacy), such evaluations were not entirely separate from the rest of the experience.

Path	Direct without mediator		Direct with mediator		Indirect		Result
	Standardized estimate	P-value	Standardized estimate	P-value	Standardized estimate	P-value	
Process Efficacy → Intention	0.461 (0.028)	0.001***	0.044 (0.062)	0.543	0.506 (0.069)	0.001***	Full mediation
Process Efficacy → Self Efficacy			0.870 (0.030)	0.001***			
Self-Efficacy → Intention			0.579 (0.063)	0.001***			
Message Efficacy → Intention	0.624 (0.031)	0.001***	0.342 (0.074)	0.001***	0.161 (0.08)	0.045*	Partial mediation
Message Efficacy → Response Efficacy			0.893 (0.029)	0.001***			
Response Efficacy → Intention			0.182 (0.079)	0.034*			

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.6 Discussion

As consumer interest in food safety increases (Grewal, Cote, & Baumgartner, 2004; Jöreskog, 1999; Mansfield & Helms, 1982), the need to more effectively communicate food safety information is pressing. In the attempt to explore the role of Internet-based platforms, and understand whether and how different Internet platform characteristics (media, information, and source characteristics) contribute to improving food safety communication outcomes (behavioral intentions), this study first proposed a model using different perceptions to organize and make sense out of consumers' experience using food safety communication websites. This study further investigated the impacts of identified perceptions on consumers' information usage intention. Lastly, this study also assessed EPPM's utility in studying food safety communication.

Results from this study supported a new theoretical model. This model expands on previous approaches in three ways: a) by integrating media characteristics in evaluating and predicting communication outcome; b) by incorporating additional efficacy perceptions relevant to individual information seeking behaviors beyond what's included in the EPPM; and 3) by establishing relationships among efficacy perceptions – particularly the discovery of full and partial mediation effect; 4) by linking physical attributes of a communication media (website in this case) to users' perceptions.

To achieve the study objectives, five methodological procedures were applied. The results of Stage 1 data analyses verified the proposed relationships between website characteristics (e.g. search box) and consumer perceptions (e.g. searchability). The EFA results suggested that the factorial structure proposed in Figure 5-1 was supported. CFA

verified the reliability of the measurement model. Through SEM analyses, this study discovered that searchability was the most influential factor for process efficacy, and saliency was the most important information attribute that impacts message efficacy. Additionally, both process efficacy and message efficacy had a direct relationship with behavioral intention. Utilizing mediation analyses, it was discovered that self-efficacy mediated process efficacy's impact on behavioral intention while response efficacy mediated message efficacy's influence on behavioral intention. Lastly, message and process efficacy as well as self- and response efficacy were correlated.

The results taken as a whole suggest that consumers experience various website characteristics (information, source, and media) and form perceptions towards these characteristics; these perceptions then lead to evaluations of efficacies and eventually behavioral intention. These findings showcase the ways media can influence the communication outcomes in mediated communication situations – media, or where the information is communicated, matters. This study not only presents the importance of media (as process efficacy is seen to directly predict behavioral intention), but also identifies the essential features that entities interested in communicating food safety information should consider. For example, having a functional search box and a site map improves user experience in looking for information (making the process easier), and thus increases their intention to use the information. If consumers are informed and taking actions to protect themselves, the losses and impacts of a foodborne illness outbreak might be greatly reduced. Additionally, supplying high quality information should still be the highest priority for entities interested in communicating foodborne

illness outbreak information as message efficacy was found to have a strong direct impact on consumers' information usage intention.

This study discovered that self-efficacy fully mediates the relationship between process efficacy and information usage intention. This means that self-efficacy explains why there's a relationship between process efficacy and behavioral intention. Improvements in the user experience in providing features that make the process of locating needed information easy will help to increase consumers' usage of information. Perceived easiness of use increases one's belief in his or her ability to find needed information (about foods and restaurants to avoid) and thus makes it individuals more likely to use the information communicated. This has very important theoretical and practical implications.

Theoretically, self-efficacy presents great explaining power in understanding how media features impact consumers' intended information usage. This allows future research to easily incorporate and test additional media features and extend the results of this study. Further, self-efficacy is definitely at core in understanding consumers' information seeking behaviors and thus scholars may want to include this variable in future explorations, particularly in searching for the reasons behind consumer information behaviors. Lastly, this research also highlights the importance of user-center research in food safety communication. Without an understanding of how consumers form perception regarding their ability to look for information and factors affecting this process, it is impossible to successfully carry out effective communications.

On a more practical note, users' perceptions of the functionalities or features on the website are important. If they are not perceived as helpful in locating the information, they will not contribute to more information usage by consumers. This can happen when unfamiliar features are provided in an attempt to reduce users' information seeking efforts. For example, previous research revealed that when consumers were provided with a site map that organized information on an unfamiliar topic (e.g. by pathogen names), they found it harder to locate the information and tended to not use the information (Ma et al., 2016a). The disconnect between functionalities and consumer perception can also happen when features are perceived to be irrelevant to information seeking. For example, the provision of two search boxes were observed to confuse consumers and have an inverse impact on consumers' information usage (Ma et al., 2016a). With these suggestions in mind, government and health agencies interested in communicating food safety information online should provide familiar features (e.g. those offered on other commonly used websites) for best communication of information.

Self-efficacy can also be influenced by one's existing knowledge and familiarity with a topic as well as one's interest in food safety. For example, for individuals who know food safety very well, they would know what keywords to put in and thus more easily find what they are looking for; a search box would be very useful in this case. But for a consumer who has very limited knowledge about foodborne illness outbreaks, a search box may not be as useful. In this sense, providing features in an attempt to improve consumer information seeking experience may work better for individuals who are more interested in and familiar with food safety. In this sense, adapting a "universal design"

mindset – designing websites to be inclusive and easy to use for everyone regardless of their knowledge of food safety can be helpful. For example, instead of listing and organizing outbreaks around pathogens that caused them, using food product or location to organize information will improve the experience for all consumers including those that are not as familiar with food safety topics. Also, using keywords that are generally used by consumers in searching to index information will also help. In fact, in study 2, it was found that the keywords majority of the participants used are not recognized by the search function and yielded no relevant results. In the future, utilizing big data analytics and identifying the most commonly used keywords by consumers when searching for information about foodborne illness outbreaks will greatly help to direct the communication efforts of government and health agencies.

Response efficacy is found to mediate the relationship between message efficacy and behavioral intention. This finding is particularly interesting in that it allows the understanding of why information quality impacts consumer information usage intention – through perceived usefulness. In other words, good information will only be used when it is perceived useful by consumers.

Research suggests that the difference in “good (high quality) information” vs. “useful information” is important to consumers. Quality of the information appears to be an evaluation based on information and source characteristics while the usefulness of information appears to be an evaluation based on personal experiences and situations.

The following examples might better illustrate this difference. A piece of information that satisfies the criteria of being good (e.g. specific, timely, and trustworthy) tells you that

the best way for you to wash your hands is to scrub with iodine soap for 5 minutes in a sterilized environment similar to what a surgeon does. This information is not very useful for consumers as it is probably impossible for consumers to do, as well as unnecessary in the home environment. Alternatively, “poor” quality information might still be viewed as very useful. For example, you found out from the health department that lettuce in your area is contaminated, but it is not clear which kind of lettuce is specifically linked to this contamination. With more specific (high quality) information, you probably would not need to avoid all lettuce varieties, but this piece of information, despite its “poor quality”, can still help you protect yourself if you avoid eating lettuce. Because of this, government and health agencies should always keep in mind the utility of the information they want to communicate. The provision of actionable recommendations or tips that are easy to do and practical is a good practice (e.g. recommending safe cooking temperatures for potentially contaminated foods). All in all, a trustworthy source’s provision of high quality information that is very specific and timely is very important; but if the information is not practical or requires too much effort to implement, consumers still will not use the information.

Additionally, it was found that consumers experience the website as a whole, and their perceptions are complex as message and process efficacy covary. In other words, good user experience (process efficacy) on a website will likely increase consumers’ perceptions of information quality (message efficacy), and vice versa. This showcases the importance of improving users’ information-seeking experience while maintaining the information quality. The traditional belief that if the information is good, users will

find it and use it is proved to be inaccurate. This does not diminish the importance of information quality. As evidenced, message efficacy is the strongest direct predictor of information usage intention. This finding aligns with the discoveries of earlier research (Ma et al., 2016b); information quality is consumers' highest priority in seeking foodborne illness outbreak information. It is therefore important to maintain or improve information quality – focusing on three dimensions, saliency, trustworthiness, and timeliness, while supplying features that would reduce users' information-seeking efforts and make the process easier.

Taking a more focused view, saliency, timeliness and trustworthiness are all important in consumers' evaluations of information quality (message efficacy), but saliency is clearly the most influential. In the past, the focus for improving food safety communication, particularly involving foodborne illness outbreaks, has been on timely updates (Food Safety News, 2016). But results of this study suggested that being specific (saliency) is more important than being timely (timeliness). When information is available, naming the specific foods and locations involved is particularly helpful; after all, consumers cannot make informed decisions if all they know is that an outbreak is occurring.

It was very surprising to observe that timeliness had a negative impact on message efficacy. One possible explanation for the negative relationship is that daily and monthly updates were used to frame timeliness of the information in the scenario. Consumers may still want to see timely information, but daily updates may be too frequent. If updates are posted daily, additional effort is required to keep track of information. Also, daily updates may give consumers the perception of constantly changing information and reduce the

perceived trustworthiness of the information. Thus, it is recommended that government and health agencies only update when needed (e.g. a new location or food is identified) and not update for the sake of updating. It seems that consumers want food safety communication to tell them what to do and not change. A website could be refreshed with the date the information was last updated (which could be every day during a serious foodborne illness outbreak) to show that the website is attended, but not changing the content when there is no new information appears to be a good practice. An RSS feed, which allows consumers who sign up to receive updates when they occur (rather than go to a website to check for frequent updates), might also be employed.

Looking at process efficacy more closely, it is shown that searchability is the only significant factor influencing consumer evaluation on ease of the process. This result highlights the central role searchability plays, especially with 71.74% variance explained solely by searchability. This means that when designing websites, a functional search box and a site map are considered must-haves. Also, features (such as keyword indexing, texts from videos, and pop-up boxes suggesting relevant information) that enhance consumers' searching experience and allow them to locate the needed information more quickly while reducing the effort required should also be considered and incorporated.

On the other hand, it is not wise to conclude that searchability is the only important factor; in fact, approximately 28.26% of the variance might be explained by other process efficacy determinants. More studies are needed to verify and expand our understanding.

In the determinants of process efficacy, interactivity behaves, even though not significantly, contrary to what has been hypothesized – it is predicted to have a positive

impact on process efficacy. This may be because consumers do not value the opportunities to interact, as was suggested in earlier research (Ma et al., 2016b). Another possibility is that consumers found interactive features to be inefficient and interfere with their process of seeking information. For example, if interactive features are offered, people can post questions and receive answers on another page or be directed to a different website or social media page for information. This may interfere with their main goal of locating the needed information to protect themselves, and reduce the usability of the website (Ma et al., 2016a). Aside from weeding through information, consumers appear to not like obtaining information from others – such information might be perceived as less trustworthy. Additionally, interactive features can be unfamiliar and thus confusing to consumers. For example, earlier research (Ma et al., 2016a) noted that consumers found the functionality of different “buttons” confusing – sometimes it was not clear if an icon was leading to more specific information, to sign up for updates, or to ask questions. Further studies are needed to examine the relationships between searchability and interactivity, as well as to explore the reasons for negative consumer attitudes towards interactivity in food safety communication.

Linkability, despite being experienced differently by consumers from searchability in research by Ma et al. (2016a), was shown to be somewhat indistinguishable from searchability as a construct as it is highly correlated with searchability in EFA and its contribution in explaining variations beyond what’s been accounted for by searchability is minimal in SEM. Linkability is similar to searchability, so it does not significantly impact behavioral intention beyond the effect of searchability; but this does not explain

why consumers experience them differently. For example, in research by Ma et al. (2016a), consumers indicated that the use of links helps them to find additional information (e.g. explanations of a concept), which is different from locating the needed information (searchability). It is possible that linkability has multiple dimensions that are more closely aligned with other characteristics of the websites such as searchability, interactivity, and/or information quality. Further explorations of consumer experience are needed. Another possibility for the insignificant influence linkability has on behavioral intention is that consumers do not prefer to see linkability features on a website as these features can be perceived as slowing down the information seeking process and making it more difficult. For example, when linked to an outside sources, consumers have to re-evaluate the information quality, and this requires additional efforts. It is also possible that the linked information is not as salient or is hard to understand. For instance, if CDC's website is linked, it is generally hard to find localized and specific information. And sometimes, despite the good quality, information can be difficult to comprehend on these websites as technical terms are often used to ensure accuracy.

With these in mind, when designing and using the website to communicate about foodborne illness outbreaks, it may be best to create a direct link to the "what's going on now" page where information of the ongoing outbreaks are updated (so consumers do not need to search extensively for outbreak updates). It may also be good to create an "alerting box" on the home page – informing consumers of ongoing outbreaks, if there are any or reassuring consumers that there are currently no ongoing outbreaks. Food safety communicating in this sense is similar to marketing communication; if you want

consumers to use the information, it is important to make it easy for them to find the information – and one way to achieve this is to draw consumer attention to the most important and relevant information. Thus, using redundant features to highlight the most relevant information can be very helpful in improving perceived process efficacy for consumers. This is not to suggest putting all details on the home page or even the “what’s going on now” update page. Rather, keep the updates simple and easy to ready so consumers can quickly determine what to do to protect themselves and links can be used to direct consumers to more detailed information if they are interested.

In examining EPPM’s utility, it was found that when confronted with a threat, perceived self- and response efficacy are predictive of information usage intention. This finding supplies support for EPPM’s power in understanding consumer food safety information-seeking behaviors. Theoretically, this study proposed and tested two additional efficacy components beyond what has previously been included in EPPM. Process and message efficacies proved to be important in determining consumers’ behavioral intentions, particularly in online communication. This finding contributes to an expanded understanding of efficacy beyond what was offered in the EPPM, and it opens doors for further use of EPPM in computer-mediated communication.

This study proposed different scenarios that varied in terms of website characteristics. The manipulations were tested to be successful, and the design of the scenarios is flexible in that additional website features can be easily incorporated. Thus this research design, particularly the setup, may be used in future studies pertaining to food safety communication online or user experience studies more broadly.

5.7 Limitations and future studies

Limitations of this study include that no observations were made of users' actual experiences using the website. All the reactions were prompted using scenarios. This is a limitation in terms of realism of this study, but it also means all other potential confounding variables were controlled. Second, the present study only selected certain website characteristics that emerged out of previous studies as important (Ma et al., 2016a) to test in the scenarios. Though the list may not be comprehensive, this setting provides an example for future exploration to incorporate additional website characteristics. Additionally, new services may emerge that would improve consumers' usage experience. Thus practitioners are encouraged to continuously monitor for new features that may impact consumers' perceptions and evaluations of the websites. Third, the scenarios were developed to solicit two possible levels (high vs. low) of perceptions. Because of this, while showing situational details, the wording could have been suggestive, and in turn, influenced participants to respond with more extreme evaluations. However, the use of scenarios in this study successfully probed significantly different levels of perceived searchability, linkability, interactivity, trustworthiness, timeliness, and saliency and thus allowed the investigation of how such perceptions influence efficacy perceptions and later behavioral intentions. Fourth, instead of actual behaviors, this study examined behavioral intentions. While a good predictor of behaviors (Ooms, Jansen, & Hoeks, 2015), intentions can be different from actual behaviors (Fishbein & Ajzen, 1977). Fifth, this study only considered situations where consumers were confronted with a threat that they perceived to be high. This, as discussed in the literature review, was

done to focus attention on efficacy and media effect. In the future, studies comparing consumer experiences when confronted with a high vs. a low level of threat may also be valuable.

Recommendations for future studies include qualitative observations of consumers' actual behaviors that would be helpful in understanding the reasons behind the relationships shown in this study. Second, in this study, searchability was the only factor influencing process efficacy; more studies are needed to verify and expand our understanding of other factors that may influence process efficacy. Third, scholars are encouraged to investigate the best update interval in communicating foodborne illness outbreak information and further explore the relationships between information timeliness and message efficacy, and later behavioral intention or behaviors. Fourth, with the advancement of technology, it is expected that new features or services will emerge that can significantly impact users' information-seeking experience online; therefore it is necessary to continuously include and test the impacts of new features. It is also important to keep in mind that with new features, new perceptions can emerge. Fifth, this study focused on consumer experience using websites because websites are consumers' preferred platform. Social media, despite its potential for food safety communication, is not the preferred platform for consumers at this time (Ma et al., 2016b). Websites are also the main online communication platform for the majority of the food safety information. As social media presents promising benefits in enhancing food safety communication, future studies may explore similar research questions using social media as the platform. It will also be valuable to compare results with social media as the platform to the results

of this study. The results can shed light on relative advantages of each platform and supply information for setting up strategies to integrate the use of both platforms. Sixth, setting up an “ideal” website and collecting user reactions to compare with user experience with existing websites can provide additional valuable insights. Seventh, this study examines six different perceptions towards website characteristics in one setting; future studies may isolate one perception at a time so the possible interactions among the perceptions are controlled. Eighth, examining the potential moderating roles of social and demographic characteristics (e.g. gender, age, education) can be valuable especially it is found that food safety knowledge can have a impact on efficacy perceptions. Ninth, perceptions of threat and their roles in food safety communication need to be further explored. More specifically, what is perceived as a threat to consumers, what factors influence threat perception (e.g. age, gender, and past experience), and whether high vs. low threat perceptions lead to different behavioral intentions all need more attention.

5.8 Conclusion

This study explored media’s effect on food safety communication. Specifically, this study examined how website characteristics, through efficacy perceptions, influence consumers’ intention to use the communicated information. The results support that not only the information quality, but also how the information is communicated can have a significant impact on consumers’ behavioral intentions. Website features that directly related to searchability (e.g. search box and site map) and saliency (provide specific information about foods and locations involved) are perceived to be most influential and should be considered in website design. The importance of communicating high quality

information over an easy-to-use media seems intuitive, yet the question of how to best accomplish this task is very hard to answer. This study provides insights and hopefully will help guide the efforts of practitioners and researchers alike.

5.9 References

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5.10 Appendices

Appendix 1. Final Factor Solution After EFA Analysis (Study 3)

Item	Message Efficacy ($\alpha=0.965$)	Process Efficacy ($\alpha=0.975$)	Severity ($\alpha=0.903$)	Interactivity ($\alpha=0.954$)	Timeliness ($\alpha=0.956$)	Trustworthiness ($\alpha=0.969$)	Susceptibility ($\alpha=0.770$)	Intention ($\alpha=0.917$)	Self Efficacy ($\alpha=0.955$)	Searchability ($\alpha=0.960$)	Linkability ($\alpha=0.956$)	Response Efficacy ($\alpha=0.947$)	Saliency ($\alpha=0.962$)
Messageefficacy2	0.947												
Messageefficacy3	0.854												
Messageefficacy1	0.753												
Processefficacy2		0.932											
Processefficacy3		0.883											
Processefficacy1		0.779											
Severity2			0.908										
Severity1			0.893										
Severity3			0.773										
Interactivity2				0.992									
Interactivity3				0.710									
Interactivity1				0.678									
Timeliness1					0.926								
Timeliness3					0.902								
Timeliness2					0.777								
Saliency2					0.327								0.240*
Saliency1					0.299								0.239*
Trustworthiness3						0.811							
Trustworthiness1						0.809							
Trustworthiness2						0.809							
Susceptibility1							0.756						
Susceptibility3							0.733						
Susceptibility2							0.420						
Intention1								0.628					
Intention2								0.505					
Selfefficacy1									0.764				
Selfefficacy2									0.687				
Selfefficacy3									0.616				
Searchability3										0.770			
Searchability2										0.659			
Searchability1										0.577			

Appendix 1 continued

Item	Message Efficacy ($\alpha=0.965$)	Process Efficacy ($\alpha=0.975$)	Severity ($\alpha=0.903$)	Interactivity ($\alpha=0.954$)	Timeliness ($\alpha=0.956$)	Trustworthiness ($\alpha=0.969$)	Susceptibility ($\alpha=0.770$)	Intention ($\alpha=0.917$)	Self Efficacy ($\alpha=0.955$)	Searchability ($\alpha=0.960$)	Linkability ($\alpha=0.956$)	Response Efficacy ($\alpha=0.947$)	Saliency ($\alpha=0.962$)
Linkability1										0.509	0.264*		
Linkability3										0.308	0.431		
Linkability2											0.364		
Responseefficacy3												0.603	
Responseefficacy1												0.518	
Responseefficacy2												0.506	
Saliency3													0.307
% of variance explained	34.765	26.870	8.412	5.687	2.715	1.915	1.593	1.339	0.939	0.77	0.586	0.556	0.464

Note: 1. Only factor loadings of 0.30 or greater are presented. 2. Results are based on oblique Rotation
 *Highest cross-loading that is below 0.3.

Appendix 2. Construct correlation matrix - discriminant validity

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Trustworthiness	(0.886)	0.638	0.757	0.658	0.632	0.566	0.648	0.555	0.594	0.000	0.000	0.621	0.774
2. Timeliness	0.799	(0.862)	0.826	0.491	0.457	0.399	0.594	0.536	0.564	0.001	0.000	0.591	0.672
3. Saliency	0.870	0.909	(0.862)	0.738	0.707	0.635	0.790	0.638	0.672	0.001	0.002	0.686	0.843
4. Searchability	0.811	0.701	0.859	(0.852)	0.916	0.878	0.714	0.464	0.529	0.000	0.005	0.520	0.627
5. Linkability	0.795	0.676	0.841	0.957	(0.869)	0.845	0.663	0.429	0.510	0.000	0.008	0.484	0.608
6. Interactivity	0.752	0.632	0.797	0.937	0.919	(0.908)	0.605	0.384	0.440	0.000	0.002	0.440	0.533
7. Process Efficacy	0.805	0.771	0.889	0.845	0.814	0.778	(0.885)	0.801	0.814	0.000	0.004	0.776	0.870
8. Self-Efficacy	0.745	0.732	0.799	0.681	0.655	0.620	0.895	(0.850)	0.826	0.002	0.002	0.832	0.783
9. Response Efficacy	0.771	0.751	0.820	0.727	0.714	0.663	0.902	0.909	(0.838)	0.000	0.000	0.790	0.839
10. Susceptibility	(0.012)	0.031	(0.025)	(0.005)	(0.011)	0.010	(0.007)	(0.040)	0.011	(0.653)	0.361	0.000	0.000
11. Severity	(0.002)	(0.015)	(0.044)	(0.074)	(0.090)	(0.046)	(0.062)	(0.045)	(0.015)	0.601	(0.753)	0.001	0.000
12. Intention	0.788	0.769	0.828	0.721	0.696	0.663	0.881	0.912	0.889	(0.005)	(0.031)	(0.848)	0.780
13. Message Efficacy	0.880	0.820	0.918	0.792	0.780	0.730	0.933	0.885	0.916	0.011	(0.003)	0.883	(0.872)

Note: 1. Values in parentheses on diagonal represent average variance extracted (AVE), values below the diagonal are correlation estimates among constructs, and values above the diagonal are squared correlations.
 2. Calculated using standardized loading.

Appendix 3. Results of hypotheses testing (Study 3)

Hypothesis	Result	Data collection	Method
1. Website characteristics (source, information, and media) affect users' perceptions of the website.	Supported	Stage 1	ANOVA
2. Users' perceptions related to information quality (trustworthiness, timeliness, and saliency) positively affect message efficacy in experiencing the website.	Partially supported	Stage 2	SEM
a. Perception of trustworthiness positively affects message efficacy	Supported		
b. Perception of timeliness positively affects message efficacy	Not supported		
c. Perception of saliency positively affects message efficacy	Supported		
3. Users' perceptions related to media usability (searchability, linkability, and interactivity) positively affect process efficacy in experiencing the website.	Partially supported	Stage 2	SEM
a. Perception of searchability positively affects process efficacy	Supported		
b. Perception of linkability positively affects process efficacy	Not supported		
c. Perception of interactivity positively affects process efficacy	Not supported		
4. Higher perceived message efficacy leads to stronger information usage intention.	Supported	Stage 2	SEM
5. Higher perceived process efficacy leads to stronger information usage intention.	Supported	Stage 2	SEM
6. Higher perceived self-efficacy leads to stronger information usage intention.	Supported	Stage 2	SEM
7. Higher perceived response efficacy leads to stronger information usage intention.	Supported	Stage 2	SEM
8. Higher process efficacy perception will lead to improved perceived self-efficacy.	Supported	Stage 2	SEM
9. Self-efficacy mediates the relationships between process efficacy and consumers' information usage intention.	Supported	Stage 2	SEM and mediation analyses
10. Higher message efficacy perception will lead to improved perceived response efficacy.	Supported	Stage 2	SEM

Appendix 3 continued

Hypothesis	Result	Data collection	Method
11. Response efficacy mediates the relationships between message efficacy and consumers' information usage intention.	Supported	Stage 2	SEM and mediation analyses
12. Process efficacy and message efficacy covary.	Supported	Stage 2	SEM
13. Self-efficacy and response efficacy covary.	Supported	Stage 2	SEM

CHAPTER 6. CONCLUSION

In this non-traditional thesis/dissertation format, this final chapter summarizes the results of all three research studies in this research and offers conclusions regarding the findings. In addition, this chapter revisits the hypotheses proposed in Chapter 2 to discuss the relevant findings and how this research supports them.

The overall purpose of this research was to explore media's role in food safety communication, particularly foodborne illness outbreak communication. Three studies were conducted to achieve this goal. In Study 1 (see Chapter 3), consumer preferences, motivation, information needs, and information use regarding foodborne illness outbreak information were assessed. Study 2 (see Chapter 4) evaluated consumers' experience using websites that communicate food safety information and mapped website characteristics to users' perceptions. Study 3 (see Chapter 5) built upon results of Studies 1 and 2 and explored the impacts of website characteristics on consumers' experience and perceptions and later behavioral intentions. This research also proposed best practices in using websites for food safety communication. Chapter 6 presents the major findings of the three studies. Both theoretical and practical implications are discussed to provide

insights for both scholars and practitioners. Finally, limitations are identified and directions for future studies are discussed.

6.1 Summary of Major Findings

Study 1: Food safety information on the Internet: Consumer media preferences.

Study 1 explored consumer preferences, motivations, information needs, and information usage. Foodborne illness outbreaks can cause considerable losses to the economy and society. Efforts to protect public health will have limited success if food safety information is not well communicated to consumers. But traditional means of communicating food safety information have limited reach and relevancy, and in this regard, social media presents great possibilities for communicating food safety information to the public. This study uses an online questionnaire to explore social media's role in foodborne illness outbreak communication. A total of 405 responses were collected in January 2016. After cleaning, a total of 370 responses were analyzed using SPSS version 23.

Results of this study indicated that the Internet was clearly the preferred media for foodborne illness outbreak information for the majority of respondents. Among Internet-based platforms, websites are, surprisingly, the most-preferred choice. Social media, despite its great potential and unparalleled benefits (e.g. offers the ability to support user-generated content and thus harness collective intelligence), is not the preferred place for consumers to gather foodborne illness outbreak information – at least at the present time.

To better understand their preferences, consumers were asked about their priorities and motivations in selecting a media. The results suggest that various information, source, and media characteristics including information accuracy, information timeliness, source trustworthiness, media usability (ease of use), media accessibility (e.g. fast), information quantity, information applicability, and media familiarity all play important roles in media selection and preference. The Internet stands out as the preferred media primarily due to its superior usability and accessibility.

In evaluating and selecting an Internet site, the same principles were carried forward. Consumers still demand easy and fast access to high-quality information (e.g. accurate and timely) from a trustworthy source. But more functionalities that are specific to Internet-based platforms emerged as essential in consumers' evaluations. More specifically, searchability is the most-valued platform functionality for consumers when looking for foodborne illness outbreak information. Linkability and interactivity are also perceived to provide value. Additionally, various security functions (e.g. less likely to have a virus, control over privacy setting, less likely to track user data, and fewer or no advertisements) emerge as important as well. Lastly, the use of multi-media (e.g. pictures and videos) improves user experience.

These findings offer an explanation of consumer preference of websites over social media. Social media may suffer from a mismatch between its offerings and consumers' priorities when seeking foodborne illness outbreak information. Social media supports more personalization and interaction, which is considered less important, while not providing superior search function, which is considered to be the most important platform

feature. Additionally, social media's interactive potential, which allows users to contribute to the contents, may have backfired and lead consumers to question the quality of information communicated. Further, social media offers limited control over design features. For example, search functions are controlled by the social media owners or corporate owners of the social media sites, so it is very difficult, if not impossible, to improve the feature. Lastly, social media also underperformed in offering more information (quantity).

Taken together, the results of this study indicated that providing high-quality information (information that is accurate, up-to-date, and trustworthy) should still be the priority in communicating foodborne illness outbreak information. When information quality is maintained, Internet-based platforms offer great potential to broaden food safety communication and protect public health.

This study also identified a small percentage of consumers who are against the use of Internet in food safety communication. This group is particularly concerned about information quality, and they feel accuracy and trustworthiness are especially hard to evaluate in Internet-mediated communications. This finding indicates that the Internet, although powerful, should not be considered a complete replacement to traditional media; it is more appropriate as a supplement or extension to traditional media.

Study 2: How consumers interact with websites to obtain food safety information: An application of Website Experience Analysis (WEA).

Study 2 was designed to evaluate user experience of websites for foodborne illness outbreak communication and link specific website characteristics with consumers' interpretation and perceptions towards the website.

Using Website Experience Analysis (WEA), Study 2 assessed four perceptions: self-efficacy, response efficacy, process efficacy, and information efficacy. The format of the questions was derived from Prominence-interpretation Theory (Fogg, 2003). In applying WEA, a pair of questions is used for each type of efficacy. The first question asks participants to evaluate their perception of an efficacy with a numeric rating. The second question asks for website elements that generate that perception. For example, the pair of questions used for self-efficacy was: "Do you feel you are able to locate the needed information?" (on a scale of 1-10, where 1 = not at all and 10 = very much); and "What on the website makes you feel this way?" (open-ended question).

In this study, self-efficacy was defined as "one's belief in his or her ability to find the needed information," response efficacy as "the extent to which one believes that looking up information will help to reduce the risk of getting sick," process efficacy as "one's belief that the process can be easily done," and information efficacy as "one's belief that the information will be helpful." Process and information efficacies were incorporated to conceptualize people's perceptions towards media and information and thus support the examination of how the media (e.g. website) and the information intermingle and influence consumers' information-seeking behaviors.

Oregon's health department website was examined by 16 participants who then answered questions about their website experience addressing key efficacy perceptions. The results showed that individuals go through a two-stage process in foodborne illness outbreak information seeking. Individuals become aware of an outbreak; then they interpret the risks, evaluate the situation, and get motivated to seek information. Next, individuals use their preferred media to obtain the needed information. In other words, after initial exposure (usually passive), individuals consciously and actively seek information. This showcases the need to address two separate issues in drafting communication strategies: how to broaden the reach so that more people become aware of an outbreak and how to improve consumers' information-seeking experience when they are looking for additional information. This finding also provides additional explanation of consumer preference of websites over social media that was found in Study 1.

Social media was expected to have great potential in dissemination food safety information to a large and very broad audience. On the other hand, study 2 found that when consumers are actively seeking additional information, social media's ability to leverage existing networking and interact with other users, appears to potentially backfire in dissemination food safety information (e.g. creates the perception of questioned information quality). Thus, social media appears to be more appropriate as a vehicle for alerting their large and broad audience at the initial stage of a food safety crisis so that their audience is aware of the need to look for food safety information.

When consumers are seeking additional information after learning about an outbreak, they are in need of information to take action and protect themselves; information quality

– characterized by trustworthiness, saliency (details), and timeliness – becomes more important. As such, websites become more suitable. To leverage the benefits of different platforms, a strategy that integrates the usage of different platforms is very appealing; for example, using social media to post updates and alert consumers about ongoing outbreaks while using links to direct consumers to websites that contain more detailed information. In the future, more exploration is needed to determine more effective uses of different platforms and combinations of platforms.

Additionally, a risk is perceived only when it is personally relevant. This implies that more localized and timely (e.g. real-time) updates may be necessary in communicating about foodborne illness outbreaks. As such, health departments may be uniquely positioned to communicate foodborne illness outbreak information, as they are generally more involved and aware of local outbreaks. Entities interested in communicating food safety information may consider working with local health departments in the attempt to improve the communication outcome.

Moreover, this study showed three information and source characteristics – trustworthiness, timeliness, and accuracy, along with three platform features – searchability, interactivity, and enhanced usability (including visuals and links) were most important when users form their perceptions (self, response, process, and information efficacies) towards the website and the information communicated. This shows that while the communication channel is important in determining communication outcomes, information quality also plays a central role. The maintenance of information quality along with better media functionalities could improve communication outcomes.

This study further discovered that information, source, and media characteristics interact in influencing consumer usage of information and that the formation of different types of efficacy perceptions may not be distinct, as some of the website features influenced more than one of the efficacy perceptions. As such, the relationships among the four efficacies appears to be very complex. It is thus important to further investigate the formation of these efficacy perceptions, the relationships among these efficacy components, and how they interact in influencing communication outcomes in the future.

Lastly, this study illustrates the value of WEA both in food safety communication practice and research. Users notice website elements, interpret the elements, and eventually form evaluations. WEA allows both preeminence (if the element is noticed) and interpretation to be assessed as the questions are not directing participant's attention to certain website elements but rather focusing on users' perceptions. This has a number of practical design applications as well as scholarly implications.

Study 3: Improving food safety communication on the Internet: Influence of media on communication outcome

Study 3 examined if and how website characteristics affect consumers' intent to use food safety information. Two online questionnaires were used to collect data in two stages. In the first stage, 195 usable responses were collected. At the second stage, two separate usable samples of 198 and 511 were collected. Using five methodological analyses (ANOVA, EFA, CFA, SEM, and mediation analyses), the study first identified and verified how consumers perceive specific website characteristics (e.g. update frequency

was linked to perceived timeliness); second, it examined how perceptions towards website characteristics influenced four efficacies (self, response, process, and message efficacy); and third, it tested how behavioral intention was impacted by efficacies.

Results of Stage 1 data collection indicated significant differences among users' perceived searchability, linkability, interactivity, timeliness, trustworthiness, and saliency when different website characteristics were presented. This verified the relationships between website characteristics and perceptions towards each characteristic discovered in Study 2.

EFA results at Stage 2 suggested that the proposed underlying factorial structure among perceptions towards website characteristics (trustworthiness, timeliness, saliency, searchability, linkability, and interactivity), efficacies (self, response, message, and process efficacy), and behavioral intention is supported. CFA results showed that the measurement model reasonably fit the data ($\chi^2=1387.750$, $df=587$, $p < 0.001$, $\chi^2/df = 2.364$, $NFI = 0.950$, $TLI = 0.965$, $CFI = 0.971$, $IFI = 0.971$, $RMSEA = 0.052$), and the reliability and validity were acceptable. Hypothesis testing was conducted with SEM model using AMOS version 23.

The full structural model included 12 latent constructs, trustworthiness, timeliness, saliency, searchability, interactivity, self-efficacy, response efficacy, message efficacy, process efficacy, and intention. The SEM results showed that the structural model fit the data reasonably well ($\chi^2 = 2556.657$, $df = 649$, $p < 0.001$, $\chi^2/df = 3.939$, $NFI = .908$, $TLI = .923$, $CFI = .929$, $IFI = .929$, $RMSEA = .077$) and thus provided a good model for understanding media's role in influencing communication outcome.

The results of the structural model indicate that perceptions of trustworthiness, timeliness, and saliency would all significantly impact the formation of message efficacy. Among the three, saliency is the most significant factor. In terms of process efficacy, only searchability has a significant impact. Interactivity and linkability were not significant predictors of process efficacy. Regarding relationships among the efficacy perceptions, message efficacy is a strong predictor of response efficacy, and process efficacy is a good predictive of self-efficacy. Both process efficacy and message efficacy had a direct relationship with behavioral intention.

Utilizing mediation analyses, it was discovered that self-efficacy mediated process efficacy's impact on behavioral intention while response efficacy mediated message efficacy's influence on behavioral intention. Lastly, message and process efficacy as well as self- and response efficacy were correlated.

The summary of hypotheses testing is shown below.

1. Website characteristics (source, information, and media) affect users' perceptions of the website. (Supported)
2. Users' perceptions related to information quality (trustworthiness, timeliness, and saliency) positively affect message efficacy in experiencing the website. (Partially supported)
 - a. Perception of trustworthiness positively affects message efficacy. (Supported)
 - b. Perception of timeliness positively affects message efficacy. (Not supported)

- c. Perception of saliency positively affects message efficacy. (Supported)
3. Users' perceptions related to media usability (searchability, linkability, and interactivity) positively affect process efficacy in experiencing the website.
(Partially supported)
 - a. Perception of searchability positively affects process efficacy. (Supported)
 - b. Perception of linkability positively affects process efficacy. (Not supported)
 - c. Perception of interactivity positively affects process efficacy. (Not supported)
 4. Higher perceived message efficacy leads to stronger information usage intention.
(Supported)
 5. Higher perceived process efficacy leads to stronger information usage intention.
(Supported)
 6. Higher perceived self-efficacy leads to stronger information usage intention.
(Supported)
 7. Higher perceived response efficacy leads to stronger information usage intention.
(Supported)
 8. Higher process efficacy perception will lead to improved perceived self-efficacy.
(Supported)
 9. Self-efficacy mediates the relationships between process efficacy and consumers' information usage intention. (Supported)
 10. Higher message efficacy perception will lead to higher perceived response efficacy.
(Supported)

11. Response efficacy mediates the relationships between message efficacy and consumers' information usage intention. (Supported)
12. Process efficacy and message efficacy covary. (Supported)
13. Self-efficacy and response efficacy covary. (Supported)

6.2 Theoretical Implications

This research provided several important theoretical implications to the literature of food safety communication and consumer information-seeking behaviors. First, this research extended the understanding of media's role in food safety communication by demonstrating that media can make a significant impact on communication outcomes. And most importantly, this study explored the mechanism through which media exercises its impact. It was found that consumers experience websites as a whole, thus media effects interact with impacts of source and information. Together, media, source, and information characteristics influence the communication outcome. This pointed out the need for development and use of comprehensive models that incorporate source, media, and information characteristics in understanding food safety communication and consumer information-seeking behaviors rather than investigations isolating media/source/information effects. Additionally, this study, through the use of perceptions and efficacies, connected website characteristics with the communication outcome (behavioral intention). In other words, this study allowed the process that produces the media effect to be comprehended. This discovered mechanism deepened our understandings of mediated food safety communication and allows the results to be applied, transferred, and expanded in the future.

Second, previous studies had not explicitly associated website characteristics with perception constructs in a food safety communication context. Study 2 of this research mapped website characteristics (information, source, and media) to specific perceptions, and later tested these relationships in Study 3. This helps to directly connect physical features and characteristics with psychological perceptions, bridge the gap between what's seen and what's interpreted, and open doors for further investigations of website usage in communication.

Third, this study proposed and tested two additional efficacy components beyond what has previously been included in EPPM. Process and message efficacies are proved to be important in determining consumers' behavioral intentions, particularly in the online communication context. The conceptualization and operationalization of the four efficacy perceptions even evolved during this research. As seen in Study 2, message efficacy was named information efficacy and defined as "one's belief that the information will be helpful." It was later found in the results of Study 2 that this definition is too similar to response efficacy – "the extent to which one believes that looking up information will help to reduce the risk of getting sick." Thus, in Study 3, information efficacy was refined to be message efficacy as defined as "a person's belief that the information found is of high quality." This stresses the importance of continuous testing and improvement. These findings contribute to an expanded understanding of efficacy beyond what was offered in the EPPM. Furthermore, the relationships among the efficacy perceptions were examined in this study, demonstrating the complex structure of efficacy. Taken together, the findings provided foundations for using efficacies in understanding consumers' information behaviors in a computer-mediated environment.

Fourth, this study examined EPPM's utility in food safety communication and considered the impacts of threat and efficacy simultaneously. It was found, when confronted with a high level of threat, improved efficacies will positively influence behavioral intention. Such results contribute evidence to the heated debate over EPPM's predictive power and the possibility of new theory. Additionally, EPPM variables were applied as predictive constructs (rather than concepts) in this study. This contribution presents one possibility in operationalizing EPPM variables and provides basis for further refinement.

Fifth, this study not only comprehensively examined information, source, and media characteristics and the resulting perceptions in one model. Future research can build upon the results of this study and focus on features or characteristics that are directly related to the more influential perceptions (e.g. searchability and saliency).

Sixth, this study discovered that self-efficacy fully mediates the relationship between process efficacy and information usage intention. This means that self- efficacy explains why there's a relationship between process efficacy and behavioral intention. Self-efficacy presents great explaining power in understanding how media features impact consumers' intended information usage. This allows future research to easily incorporate and test additional media features and extend the results of this study. Further, self-efficacy is definitely at core in understanding consumers' information seeking behaviors and thus scholars may want to include this variable in future explorations, particularly in searching for the reasons behind consumer information behaviors.

Further, response efficacy is found to mediate the relationship between message efficacy and behavioral intention. This finding is particularly interesting in that it allows the

understanding of why information quality impacts consumer information usage intention – through perceived usefulness. In other words, good information will only be used when it is perceived useful by consumers. This suggests that consumer evaluation of information quality and usefulness are separated to an extent. In the future, research that includes information quality as a variable will want to consider the role of information usefulness as well.

Seventh, the results of this study pointed out that the interpretation of interactivity needs further exploration. It can be argued that interactivity contains multiple layers of meanings; interactions can happen with other users, with the system, and with the information. In this sense, the ability to connect with others (humans), the ability to drill down to information that is more relevant and specific, and the ability to specify references by providing feedback to the system can all be considered examples of interactivity in its broad sense. If this is the case, social media's considerable key advantage over websites – allowing two-way communication – may in fact be available on all Internet-based channels (including websites). Users can always engage in the communication by specifying “their preferences via the mouse, touchpad, keyboard, joystick, and other input devices” (Sundar, 2007, p. 89), and thus the information flow is two-way. This may mean that when evaluating media's potential to improve food safety information, considering whether perceptions of usability and quality are generated is more important than assessing whether the certain features exist. Social media's potential may lay in its integration in consumers' daily lives (e.g. being able to leverage existing social network) rather than its superior platform features.

Eighth, another unique contribution of this study is its methodological design. This study employed a mixed design focusing on user experience with the websites. Utilizing both quantitative and qualitative methods, this study examined users' actual interactions with a real website as well as tested EPPM's utility in understanding food safety communication. Because of the rigorous methodological design, this study was able to gain detailed information about individuals' experience while acquiring generalizable results about the predictive relationships among constructs. This is particularly valuable as media's role has been largely overlooked in the past food safety communication literature. The methodology can be transferred, modified, and applied in the future when similar research questions are raised in different contexts.

Ninth, the setting of scenarios in Study 3 provides an example of how physical features of websites can be manipulated and used to probe different perceptions. This method can be extended to future studies pertaining to food safety communication online, or user experience studies more broadly.

Tenth, WEA's application and value were demonstrated through this study. WEA is valuable in understanding user experience as the data is collected through observation and think aloud processes and the participants' attention were not directed and biased. This allows mapping of physical features to users' interpretation and perceptions. Thus, WEA can be a useful tool in future communication and broader user experience studies.

6.3 Practical Implications

The results of this research highlighted media's important role in influencing communication outcome. The findings can be used as guidelines to develop effective food safety communication strategies.

First of all, it is clear that the Internet is the preferred place for information for the vast majority of consumers. Government and health agencies cannot afford to rely solely on newspaper, TV, or radio as the primary channel for food safety communication. To be relevant to consumers today, they must be online. This is not to suggest that traditional media should be replaced completely, but rather, the Internet should be incorporated into the overall communication strategy.

Among Internet-based platforms, websites were determined by consumers to be the most appropriate for food safety communication. Thus, a well-designed website is recommended rather than jumping too quickly into emerging platforms such as social media. These platforms have great potential, but they need to be used strategically since consumers, at the present time, still prefer to seek out foodborne illness outbreak information on websites.

When interpreting consumers' preferences for websites over social media, trust can be the key reason. In fact, consumers' distrust of social media for food safety information is observed in While social media presents two superior functionalities – allowing user-generated contents and supporting more interactions (Ellison, 2007; O'Reilly, 2005, 2009), – these functions are not highly valued by consumers. Because of this, it may be

more reasonable to leverage consumers' existing social network and use social media as a tool to alerting consumers and make them become aware of an outbreak rather than a media to disseminate detailed information to avoid misinformation.

Frewer, Howard, Hedderley, and Shepherd (1996) also noted that “complete freedom does not lead to trust,” rather, moderate accountability is perceived to be most trusted. User-generated content, which allows the greatest amount of flexibility, is not appreciated or trusted as high-quality information. This is possibly because user-generated content requires extra effort to evaluate quality, and users are unwilling or unable to do so even when the source posting the information is clearly visible. Thus, when using social media, it is recommended to limit the amount of contents generated by users; instead, post information directly.

It is also not wise to go completely digital in food safety communication. As seen, a certain group (about 13% of the participants) is very skeptical of online communication; to reach them, use of traditional media is still best. In sum, government and health agencies should gradually move their communication efforts online, with a focus on using websites; they should remain active in traditional channels and keep an eye on emerging new platforms.

This research also discovered that foodborne illness communication is not a one-step process; individuals go through two stages before they reach the point where a decision is made to use or ignore the information communication. For government and health agencies at the first stage, reaching a broader range of consumers (making them aware of an outbreak) is generally the goal. In this case, social media, along with other forms of

traditional media such as TV, newspapers, and radio can all be effective. Social media may be superior in that it offers the benefits of high speed (Tinker & Fouse, 2009), high accessibility (Duggan et al., 2015), low cost (Thackeray et al., 2012; Trouten, 2013), high scalability (Glasgow et al., 2006), and high message fidelity (Snyder, 2001).

Additionally, social media allows food safety communication to leverage consumers' existing social network, which will support the information to be communicated to previously harder-to-reach individuals and to a large and diverse range of consumers (ripple effect). Furthermore, as trust is a central issue in food safety communication (Lobb, 2005), social media allows consumers to get information from their families and friends – which are considered to be among the most trusted sources of food safety information (Kornelis et al., 2007). For these reasons, social media can be a powerful supplement to websites in online food safety communication. While online communication present great potentials, traditional medias continue to supply values in food safety communication, especially when currently, most consumers become aware of an outbreak through traditional medias, including TV, radio, and newspaper.

At the second stage, consumers process the risks and consciously seek out information to protect themselves. The primary goal of food safety communication at this stage is to supply high-quality information as consumers are deciding their actions. It was shown in this study that media is influential during this process, but media characteristics interact with source and information characteristics in determining communication outcome – in essence, consumers experience websites as a whole. Making it effortless to find bad information is not going to help consumers. Having high-quality information will not guarantee information usage either. It is therefore important to maintain and improve

information quality while offering functionalities to reduce efforts associated with information seeking. To communicate high-quality information through an easy-to-use media is the principle government and health agencies should always keep in mind.

Regarding media usability, searchability is the most important determinant. As such, incorporating more powerful search functions (e.g. support fuzzy key word recognition, filtration of search results according to specific criteria, and use of location services) is highly recommended. Additionally, interactivity is not highly valued in communication about foodborne illness outbreak information. Though engaging consumers sounds great, government and health agencies may want to consider saving their resources and energy by reducing interactions with consumers. This by no means suggests that government and health agencies should stop listening to consumers and attending to their needs; this simply means that when communicating about an ongoing outbreak, interactions are not a priority – helping consumers locate needed information quickly and effortlessly is more important. Designs should revolve around the goal of reducing consumer effort in information seeking.

In terms of information quality, saliency is the single most important attribute government and health agencies should strive to achieve in order to improve communication outcome. To supply specific and detailed information whenever available will help consumers make more informed decisions. Interestingly, it was observed that consumers trust health department more in food safety communications; working in collaboration with health departments is a good way to improve consumer trust and usage of information. This study also discovered that updating too frequently, such as daily,

could result in the reverse effect and lead to lowered evaluation of information quality by consumers as consumers may perceive daily updates to be inconsistency (e.g. government and health agencies are changing their minds about information communicated).

Users' perceptions of the functionalities or features on the website, instead of the functionalities or features themselves, are important. If they are not perceived as helpful in locating the information, they will not contribute to more information usage by consumers. Thus, when communicating about foodborne illness outbreaks, providing familiar features (e.g. those offered on other commonly used websites) that are intuitive to use (straightforward) can be a good practice.

With this in mind, when designing and using the website to communicate about foodborne illness outbreaks, it may be best to create a direct link to the "what's going on now" page where information of the ongoing outbreaks are updated (so consumers do not need to search extensively for outbreak updates). It may also be good to create an "alerting box" on the home page – informing consumers of ongoing outbreaks, if there are any or reassuring consumers that there are currently no ongoing outbreaks. Food safety communicating in this sense is similar to marketing communication; if you want consumers to use the information, it is important to make it easy for them to find the information – and one way to achieve this is to draw consumer attention to the most important and relevant information. Thus, using redundant features to highlight the most relevant information can be very helpful in improving perceived process efficacy for consumers. This is not to suggest putting all details on the home page or even the "what's

going on now” update page. Rather, keep the updates simple and easy to ready so consumers can quickly determine what to do to protect themselves and links can be used to direct consumers to more detailed information if they are interested.

Consumers evaluate information quality separately from information usefulness. Quality of the information appears to be an evaluation based on information and source characteristics while the usefulness of information appears to be an evaluation based on personal experiences and situations. Because of this, government and health agencies should always keep in mind the utility of the information they want to communicate. To provide actionable recommendations or tips that are easy to do and practical is a good practice (e.g. recommending safe cooking temperatures for potentially contaminated foods). All in all, a trustworthy source’s provision of high quality information that is very specific and timely is very important; but if the information is not practical or requires too much effort to implement, consumers still will not use the information.

Lastly, learning from examples is a promising way of improving. As indicated, the website of the state of Oregon’s health department, though not perfect, is attempting to integrate digital media in food safety communication. Additionally, government and health agencies may want to avoid some pitfalls identified on this website. Specifically, it was found that consumers experience website negatively when it lumps all information together without clear organization, supplies general information without a lot of details, misuses visuals (excessively using different colors, no picture or videos, and uncoordinated presentations), provides unfunctional search boxes (such as keyword recognition was weak, cannot filter results based on time and location, and having more

than one search box without clearly label them), and uses technical terms (especially when there are no explanations). “Standing on the shoulders of giants” will help government and health agencies quickly get started setting up their websites.

6.4 The linkages among the three studies

Taken together, the three studies in this research built onto each other and progressively extended our understanding of media’s role in food safety communication. A few important lessons were learned in the process of conducting these three interlinked studies. First, the interaction among media, information, and source characteristics became apparent. In designing study 1, based on the review of previous literature, it seemed that offering an improved media experience (e.g. superior functionalities) would result in better communication outcomes, and this was why the focus of study 1 was on consumer media preferences. As the research progressed, it was found that consumers experience websites as a whole, they evaluate media, information, and source together (study 2). Thus, simply improving one aspect may not result in better communication outcomes; this was then confirmed in study 3.

Second, the conceptualization of consumer perceptions towards information and media became clearer. Insights gained from study 1 suggested the inclusion of additional efficacy perceptions (process and message). The refinement of the definitions of process efficacy (the name used in both studies 2 and 3) and information/message efficacy (information efficacy was used in study 2, and message efficacy was used in study 3) was possible based on the results of study 2. And study 3 proposed and tested relationships among four efficacy perceptions and shed light on how media exercises its impact on

communication outcomes. In study 1, it was found that both media usability and information quality were important to consumers. Study 2 further demonstrated that consumers' perceptions towards information and media are complex and indicated the need to refine the definitions of newly proposed efficacy perceptions (particularly information efficacy). Thus, in study 3, message efficacy was used in place of information efficacy to minimize possible confusion with current usage of information efficacy in literature, and the definition changed from perceived usefulness (which overlaps with response efficacy in consumers' mind) to perceived information quality.

Third, the three studies together established the links among what's seen (website characteristics), what's perceived (efficacy perceptions), and what's done (information usage). As proposed in the research framework (see Figure 6-1), study 1 discovered consumers' priorities (website characteristics) in seeking food safety information, study 2 mapped consumer perceptions and evaluations of a website to specific website characteristics, and study 3 linked perceptions to information usage. Such links between website characteristics and communication outcomes supplies valuable insights that will help researchers and practitioners alike to improve online food safety communication (e.g. what feature to include on the website and the outcome of offering a feature on the website).

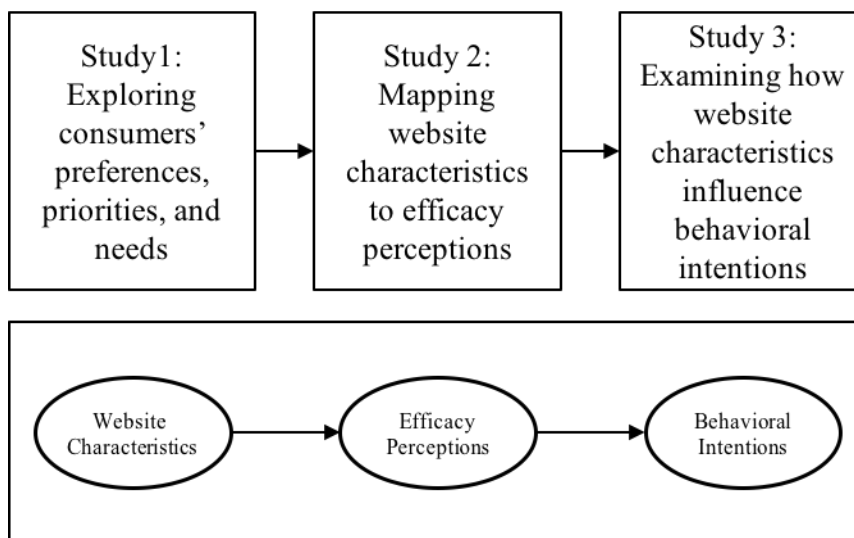


Figure 6-1. Research framework

Four, social media's role in food safety communication becomes clearer. As the two-stage process of obtaining food safety information was discovered, the need to employ different media and leverage their unique benefits became clear. At the beginning of this research, social media, with its many unique benefits, seemed to be a promising new channel for food safety communication. In fact, multiple studies have discussed social media's potential in food safety communication (Chapman et al., 2014; Harris et al., 2014; Harris et al., 2013). But it was discovered that social media was more appropriate for alerting consumers and making them aware of an outbreak instead of disseminating detailed information; websites are best used to communicate detailed information.

Five, the discovery of a two-stage communication process provides a better understanding of consumer information needs and thus assists further explorations in best communication strategies. Study 2 showed that consumers first became aware of an outbreak, and if the threat was perceived to be personally relevant, they became

motivated and sought additional information. With this in mind, study 3 specifically focused on how media can influence consumer information seeking at stage 2 and was able to conclude that media (where the information was communicated) matters. Future studies may also want to explore how to improve consumer experience at stage 1.

Six, the three studies supplemented each other and together supplied insights in consumer cognitive processing (study 2) as well offered generalized results (studies 1 and 3). Study 1 used a survey to explore consumer preferences, motivations, and needs and thus served as the foundation for study 2; study 2 utilized WEA, a qualitative research protocol, and studied consumer experiences with websites used for food safety communication and the resulting cognitive and evaluative processing; finally, study 3 employed a scenario-based survey, tested insights gained from study 2 in a large scale, and offered recommendations that can be transferred and used by researchers and practitioners alike.

6.5 Limitations and future study suggestions

Even though this study made important theoretical and practical contributions, it is not free of limitations. The first limitation of Study 1 is that in distributing the survey, the goal was to get a representative sample of the U.S. population, but as seen, the participants are concentrated in the younger age groups. Further, because the data was collected online, the response group may have had more access to the Internet. However, as the majority of the population has access to the Internet (Perrin & Duggan, 2015), and the focus of this research was to examine the role of Internet-based platforms in food safety communication, the data collection method was considered appropriate. Future studies are encouraged to collect data offline and compare results with this study.

Study 2 has limitations as well. First, Study 2 targeted younger populations, and whether the results could be generalized to all populations is not established. Second, only one website was used in this study for data collection. In the future, researchers may want to select a few websites, carry out studies using the same procedures, and contrast the results. Third, participants may not mention certain features that are also important because they are absent from the website used for data collection. In the future, to verify the robustness of the results, comparisons across different platforms, including both websites and social media, could be done.

Study 3 includes a few limitations as well. First, since scenarios are used rather than actual observations, there's no real threat to participants. While allowing control over other confounding variables, this study can be criticized as lacking realism. Second, online data collection resulted in an overall younger sample; whether this influences the results is unknown. Third, information usage intention was used as the dependent variable of concern. This study did not access consumers' patronizing intentions towards the restaurant, which is the logical next step. This is because the main goal of this research is to examine media's role in influencing the communication outcome, and information usage is commonly used as a communication outcome. Future research may want to extend the results of this study and examine how media can potentially influence consumers' patronizing intentions.

Additionally, there are some global limitations associated with all studies in this research. First, restaurant segment was not considered. It is possible that consumers have different expectations when an outbreak happens in different segments of a restaurant. Future

studies are needed to prove or disapprove the difference. Second, this research focuses on foodborne illness outbreaks in restaurants. Foodborne illness outbreaks can happen in other settings, such as grocery stores. Also, a recall usually accompanies the ongoing outbreak. In the future, scholars may want to take grocery stores into consideration and determine if the same relationships among factors influencing communication outcomes would still hold. Examining whether recall communication can be combined with communication of an outbreak is also valuable. Third, collecting data during an actual outbreak can potentially increase participants' interest and concern and thus leaves bias in the data. But with a large enough sample, such bias would be accounted for. Additionally, judging by the frequency of outbreaks investigated by CDC (CDC, 2016a), at a given point of time, there would be at least one ongoing outbreak. It is still important to note that the data collection of Study 1 coincided with a multi-state outbreak associated Chipotle (CDC, 2016d), data collection of Study 2 happened concurrently with a *Salmonella* outbreak linked to alfalfa sprouts (CDC, 2016c), and Study 3's data was collected during a period where frozen vegetables from multiple states were found to be contaminated by *Listeria* (CDC, 2016b).

There are some additional promising directions for future research. First, utilizing big data analytics to pinpoint trends and patterns in consumer usage behaviors will help government and health agencies to best design their offerings to communicate food safety information with the public (e.g. what keywords consumers most commonly use and should be incorporated and recognized in the search function). Second, a comparison between high vs. low threat level could be valuable in understanding consumer reactions in a boarder context. Third, inclusions of additional, particularly newly emerged media,

services and features could extend our understanding. Fourth, designing and rolling out an “ideal” website, using it to communicate ongoing outbreaks, and examining consumers’ reactions and behaviors would be especially helpful in testing the robustness of the results. Fifth, exploring other factors that can potentially contribute to the formation and change of efficacies aside from perceptions towards website characteristics would also be beneficial. Sixth, comparing how consumers process information delivered through different formats (e.g. text vs. method) on the same media can help to more specifically understand consumers’ preferences. Seventh, examining social media’s potential in reaching boarder audiences and mapping out how information is disseminated/flowed can be interesting and valuable. Social media’s “virality” or viral nature can be leveraged through the identifications and connections with influencers, and utilizing network analysis or social media monitoring to identify influencers will be valuable in directing food safety communication efforts. Eighth, this study, as one of the very first attempts to conceptualize and test relationships among different efficacy components, would benefit from continuous testing and improvement.

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APPENDIX

APPENDIX

Questionnaire for study 1

Greetings from Purdue! The School of Hospitality and Tourism Management at Purdue is conducting research titled "How do consumers find out about food safety information?" I am excited to invite you to participate! This survey will take about 10-15 minutes to complete, we would really appreciate it if you could answer all of the questions. All responses will be anonymous and confidential, and participation for this study is voluntary.

Thank you!

Joy Ma, PhD candidate, mjing@purdue.edu
Dr. Barbara Almanza, PhD, RD, almanzab@purdue.edu

I. Please answer the following questions based on how you look for information about foodborne illness outbreaks. Imagine a foodborne illness outbreak occurred in your area. Lots of people became sick and many of those were hospitalized. Likely foods were thought to be chicken, lettuce, ground beef, or possibly dairy products (including ice cream). At least one restaurant appears to be involved as well as some grocery stores. Now suppose you need to buy groceries and are planning to eat out in the next day or two. Based on your typical reactions in such situations, what do you think you would do?

1. Which do you think would be your most common source of information for foodborne illness outbreaks? (Please select only one)

- I would not look for this kind of information
- Friends and family
- Local or state health departments
- Federal government agencies
- Industry sources (food companies, grocery stores, associations, etc.)
- Television
- Newspapers
- Health professionals
- Other, please specify _____

Answer If I. Consumer use of different kinds of food safety information Please answer the following ques... I do not look for this kind of information Is Selected

2. Why would you not look for this kind of information?

- I am not interested in it
- I think that the foods I eat are safe
- It is too hard to get the information
- I personally don't think I am likely to get sick
- I don't trust the information I get
- I think that if the food is well cooked and hot when I eat it, it will be safe
- The information generally is not very helpful
- Someone else generally makes the decisions about foods (e.g. what to buy at grocery stores or which restaurant to eat at)
- I already know how to protect myself
- Other, please explain _____

If I am not interested in it Is Displayed, Then Skip To End of Block

2a. Even though you might currently get information about foodborne illness outbreaks in a different way, how would you prefer to get this kind of information? (Please rank these from 1-6, with 1 = your most preferred, 2 = your second most preferred, etc.)

- _____ Face to face
- _____ Phone calls or texts
- _____ Television
- _____ Newspaper, book, magazine or other printed material
- _____ Internet
- _____ Other, please specify (type in your answer and the rank)

2b. How many times do you think you would have looked up information about the foodborne illness outbreak during the event? (Please answer the number of times per week). (Please put in a number)

4b. Which of the following (social media or websites) do you think would be best in each of these categories for information about foodborne illness outbreaks that involves restaurants? (Choices appear in a dropdown box for each statement)

	Social media (e.g. Facebook, Twitter & Instagram)	Websites
Fastest way to get information	<input type="radio"/>	<input type="radio"/>
Easiest way to get information	<input type="radio"/>	<input type="radio"/>
Most common way that I get information	<input type="radio"/>	<input type="radio"/>
Best way to get the most trustworthy information	<input type="radio"/>	<input type="radio"/>
Best way to get the most accurate information	<input type="radio"/>	<input type="radio"/>
Best way to get the most up to date information	<input type="radio"/>	<input type="radio"/>
Best way to get information that applies to me personally	<input type="radio"/>	<input type="radio"/>
Best way to get the most information	<input type="radio"/>	<input type="radio"/>

5. Why would you get information about foodborne illness outbreaks from a state or local governmental source?

6. Why would you not get information about foodborne illness outbreaks from a state or local governmental source?

7. If you were to use an Internet site to get information about foodborne illness outbreaks, which of these would you prefer to use? (Please rank these from 1-5, with 1 = your most preferred, 2 = your second most preferred, etc.)

_____ Facebook

_____ Twitter

_____ Website

_____ Instagram

_____ Other, please specify (type in the site and your rank)

8. In your opinion, what is important to you when selecting an Internet site (e.g. Facebook, Twitter, Instagram, or a website) for information about foodborne illness

	Not at all important 1	2	3	4	5	6	Extremely Important 7
It allows me to control my privacy settings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do not care about any of these	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other, please specify	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. In your opinion, which Internet site (Facebook, Twitter, Instagram, or a website) best matches the statement. (Choices appear in a dropdown box for each statement)

	Facebook	Twitter	Instagram	Website
Best search function	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Best way to ask questions and get responses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most up to date	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Best visual options (e.g. pictures and videos)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most accurate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most transparent (e.g. I can see who is posting the information)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fewest or no annoying advertisements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most secure and least likely to have a virus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Least likely to track my data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Allows the most control over my privacy settings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

III. Please answer the following questions based on your personal beliefs about food safety.

1. Please indicate the extent to which you agree or disagree with the following statements.

	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
I am concerned about the safety of food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am interested in getting food safety information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In general, I feel I am able to find food safety information when I need it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know how to find food safety information online when I need it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. I've never heard of Facebook.

- True
 False

If True Is Selected, Then Skip To End of Survey

You are almost finished! Thank you for your participation so far, only a few more questions to go!

1. You are

- Male
 Female

2. In what year were you born?

3. What is the highest level of education you have completed?

- Less than high school
 High school graduate (or equivalent)
 Some college (1-4 years, no degree)
 Associate's degree (including occupational or academic degree)
 Bachelor's degree (BA, BS, etc.)
 Master's degree (MA, MS, etc.)
 Professional school degree (MD, DDC, JD, etc.)
 Doctoral degree (PhD, EdD, etc.)

4. Which statement describes your household?

- No children
- Children under 6 years old
- Children 6 years old and over
- Other, please specify _____

5. How many times have you personally experienced foodborne diseases in the past year?

6. In which state do you currently reside?

Instrument for study 2

Pre interview questions:

1. In what **year** were you born?
2. Education – highest level of education you have completed
3. How long have you been using a **personal computer**? _____ Years _____
Months
4. How often do you use a personal computer? a) Constantly b) Several times a day c) Everyday d) 2-3 times a week e) Once a week f) 2-3 times a month
5. How long have you been using the **Internet**? _____ Years _____ Months
6. How frequently do you use the Internet? a) Constantly b) Several times a day c) Everyday d) 2-3 times a week e) Once a week f) 2-3 times a month

If qualified then sit down in front of the computer:**A. Information seeking behaviors**

1. Sit them down, assign the task of “please look for the most recent foodborne illness outbreak information around you, please do whatever you would like to do, and use any tool(s) you would like. Feel free to use the computer in front of you if you would like”.
2. Observe their behaviors
 - a. What they use? Internet? Cell phone? – Why?
 - b. Where they go first – Google, a certain website... - asking why?
 - c. Where they end up find the information? – What makes them use that site?

B. WEA

1. Pull up Organ HD’s website, ask about first impression.

Phase 1: First impression

- 1) What is your first impression of this website?
Very bad 1 2 3 4 5 6 7 8 9 10 Very good

Please describe your first impressions of this website. What aspects of the website influenced your first impression?

- 2) Do you expect to find good quality content on this website?
 a) Yes
 b) No
 What aspects of the website make you feel the way you do?

- 3) Do you expect to find useful content on this website?
 a) Yes
 b) No

What aspects of the website make you feel the way you do?

2. Assign the task “please look for the most recent foodborne illness outbreak information in Organ using this website”.

Please continue browsing the website page and look for the food safety information you are instructed to. And when you formed an opinion of it, I will ask you some questions.

Phase 2: Exploration

- 4) Do you feel you can locate the needed information?
 (not at all) 1 2 3 4 5 6 7 8 9 10 (very much)

What on the website makes you feel this way (**both functionality and contents**)?

- 5) Do you feel that the process of locating needed information is easy?
 (not at all) 1 2 3 4 5 6 7 8 9 10 (very much)

What on the website makes you feel this way?

- 6) Do you feel that the information communicated is helpful to you in making dining choices?
 (not at all) 1 2 3 4 5 6 7 8 9 10 (very much)

What on the website makes you feel this way?

- 7) Do you feel that taking the action of looking up food safety information (this action is the response/ solution) will help you reduce the risk of getting foodborne illness?
 (not at all) 1 2 3 4 5 6 7 8 9 10 (very much)

What on the website makes you feel this way?

- 8) Do you feel that something like this would/ is likely to happen to you?
 (not at all) 1 2 3 4 5 6 7 8 9 10 (very much)

What on the website makes you feel this way?

- 9) How serious do you feel this is?
(not at all) 1 2 3 4 5 6 7 8 9 10 (very much)

What on the website makes you feel this way?

- 10) Now you get this information, would it impact any food decisions you made?
(not at all) 1 2 3 4 5 6 7 8 9 10 (very much)

Why or why not?

Phase 3: Exist

- 11) What is your overall evaluation of this website?
(Horrible) 1 2 3 4 5 6 7 8 9 10 (Very good)

What (website elements) contribute to your overall evaluation of the website?/ What makes you think this way?

- 12) Do you think this website does a good job in providing the kind of food safety information you are looking for (3 kinds)?
(Horrible) 1 2 3 4 5 6 7 8 9 10 (Very good)

What makes you think so?

- 13) Anything you wish this site could improve to make your experience (of looking for food safety information) better?

- 14) We are assessing this in this specific state right now, but we are trying to see if it works in other states as well. If this were something that happens in your area, would you “subscribe” to this website?
(No, not likely) 1 2 3 4 5 6 7 8 9 10 (Yes, very likely)

Why?

- 15) Would you visit this website again?
(Not at all) 1 2 3 4 5 6 7 8 9 10 (Very much)

What aspects influenced your decision?

- 16) Would you look for this kind of food safety information (FBI) in the future?
(Not at all) 1 2 3 4 5 6 7 8 9 10 (Very likely)
Why?

17) How would you like this kind of food safety information be communicated to you?

Why?

18) Do you think posting a direct link on social media would be helpful?

(Not at all) 1 2 3 4 5 6 7 8 9 10 (Very likely)

Why?

3. Before finishing, some final questions:

1) Are you familiar with this Health Department's website?

a) Very familiar

b) I've heard the name, but I don't know much about it

c) Not familiar at all

2) Are you aware of what happened at Chipotle?

If yes, how did you get to know?

3) Where do you normally get food safety information (outbreak)?

Website

Social media

TV

Newspaper

Friends and family

I do not care about food safety

I trust the system to protect me so I do not feel I need to look for food safety information

Questionnaire for study 3

Greetings from Purdue! The School of Hospitality and Tourism Management at Purdue is conducting research titled "How do consumers find out about foodborne illness outbreaks?" I am excited to invite you to participate!

This survey will take about 10-15 minutes to complete; we would really appreciate it if you could answer all of the questions. You must be 18 years old or older to participate. All responses will be anonymous and confidential, and participation for this study is voluntary.

Thank you!

Joy Ma, MS, mjing@purdue.edu
Dr. Barbara Almanza, PhD, RD, almanzab@purdue.edu

I. Before we start, we'd first like to tell you a little about **foodborne illness outbreaks**.

A foodborne illness outbreak is defined as an incident in which two or more persons experience a similar illness resulting from the ingestion of a common food. Symptoms generally include vomiting, fever, cramps, and diarrhea. Avoiding contaminated foods is the single most important thing people can do to protect themselves from getting sick.

Assume last week you ate out 3 times in different restaurants in the city where you live. Now imagine that a **foodborne illness outbreak has happened in your city**. At least 100 people have become sick and 17 have been hospitalized.

Please indicate the extent to which you agree or disagree with the following statements.

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
1. I am at risk for getting sick during this foodborne illness outbreak							
2. I believe that this foodborne illness outbreak is severe							
3. It is likely that I will get sick during this foodborne illness outbreak							
4. This foodborne illness outbreak sounds serious to me							

5. It is possible that I will get sick during this foodborne illness outbreak							
6. I believe that this foodborne illness outbreak is significant							

7. Will you look for more information about this outbreak?

Definitely will not	Probably will not	Might or might not	Probably will	Definitely will

II. Information seeking process

Variations 1-10, each participant will only get one variation.

Variation 1- None

Now assume that you went online to look for information. In your search for more information, you found a website. This website is **not a health department website but contains information about this foodborne illness outbreak.**

There were **no functions that allow you to search for information** on this site (e.g. you did not find a search box or a site map of topics). You found some updates that were posted **monthly**. **Links to relevant information outside the website weren't available** (e.g. there were no links to government websites, videos, or expert sources). You **did not find any options to interact** on this site (e.g. no comment box or email link to ask questions or leave comments, and no option to share information from this site). On this site, your city has been identified as the outbreak location, but **no food(s) or restaurant(s)** involved in the foodborne illness outbreak are given.

Variation 2- Searchability

Now assume that you went online to look for information. In your search for more information, you found a website. This website is **not a health department website but contains information about this foodborne illness outbreak.**

There were **functions that allow you to search for information** on this site (e.g. you found a search box and a site map of topics). You found some updates that were posted **monthly**. **Links to relevant information outside the website weren't available** (e.g. there were no links to government websites, videos, or expert sources). You **did not find any options to interact** on this site (e.g. no comment box or email link to ask questions or leave comments, and no option to

share information from this site). On this site, your city has been identified as the outbreak location, but **no food(s) or restaurant(s)** involved in the foodborne illness outbreak are given.

Variation 3- Linkability

Now assume that you went online to look for information. In your search for more information, you found a website. This website is **not a health department website but contains information about this foodborne illness outbreak**. There were **no functions that allow you to search for information** on this site (e.g. you did not find a search box or a site map of topics). You found some updates that were posted **monthly**. **Links to relevant information outside the website were available** (e.g. there were links to government websites, videos, or expert sources). You **did not find any options to interact** on this site (e.g. no comment box or email link to ask questions or leave comments, and no option to share information from this site). On this site, your city has been identified as the outbreak location, but **no food(s) or restaurant(s)** involved in the foodborne illness outbreak are given.

Variation 4- Interactivity

Now assume that you went online to look for information. In your search for more information, you found a website. This website is **not a health department website but contains information about this foodborne illness outbreak**. There were **no functions that allow you to search for information** on this site (e.g. you did not find a search box or a site map of topics). You found some updates that were posted **monthly**. **Links to relevant information outside the website weren't available** (e.g. there were no links to government websites, videos, or expert sources). You **found options to interact** on this site (e.g. there were comment box and email link to ask questions or leave comments, and options to share information from this site). On this site, your city has been identified as the outbreak location, but **no food(s) or restaurant(s)** involved in the foodborne illness outbreak are given.

Variation 5- Timeliness

Now assume that you went online to look for information. In your search for more information, you found a website. This website is **not a health department website but contains information about this foodborne illness outbreak**. There were **no functions that allow you to search for information** on this site (e.g. you did not find a search box or a site map of topics). You found some updates that were posted **daily**. **Links to relevant information outside the**

website weren't available (e.g. there were no links to government websites, videos, or expert sources). You **did not find any options to interact** on this site (e.g. no comment box or email link to ask questions or leave comments, and no option to share information from this site). On this site, your city has been identified as the outbreak location, but **no food(s) or restaurant(s)** involved in the foodborne illness outbreak are given.

Variation 6- Saliency

Now assume that you went online to look for information. In your search for more information, you found a website. This website is **not a health department website but contains information about this foodborne illness outbreak**. There were **no functions that allow you to search for information** on this site (e.g. you did not find a search box or a site map of topics). You found some updates that were posted **monthly**. **Links to relevant information outside the website weren't available** (e.g. there were no links to government websites, videos, or expert sources). You **did not find any options to interact** on this site (e.g. no comment box or email link to ask questions or leave comments, and no option to share information from this site). On this site, **both foods and restaurants involved in the foodborne illness outbreak are given**.

Variation 7- Trustworthiness

Now assume that you went online to look for information. In your search for more information, you found a **health department website**. There were **no functions that allow you to search for information** on this site (e.g. you did not find a search box or a site map of topics). You found some updates that were posted **monthly**. **Links to relevant information outside the website weren't available** (e.g. there were no links to government websites, videos, or expert sources). You **did not find any options to interact** on this site (e.g. no comment box or email link to ask questions or leave comments, and no option to share information from this site). On this site, your city has been identified as the outbreak location, but **no food(s) or restaurant(s)** involved in the foodborne illness outbreak are given.

Variation 8- All

Now assume that you went online to look for information. In your search for more information, you found a **health department website**. There were **functions that allow you to search for information** on this site (e.g. you found a search box and a site map of topics). You found some updates that were posted **daily**. **Links to relevant information outside the website were available** (e.g. there were links to government websites, videos, or expert sources). You **found options to**

interact on this site (e.g. there were comment box and email link to ask questions or leave comments, and options to share information from this site). On this site, **both foods and restaurants involved in the foodborne illness outbreak are given.**

Variation 9- MF

Now assume that you went online to look for information. In your search for more information, you found a website. This website is **not a health department website but contains information about this foodborne illness outbreak.** There were **functions that allow you to search for information** on this site (e.g. you found a search box and a site map of topics). You found some updates that were posted **monthly.** **Links to relevant information outside the website were available** (e.g. there were links to government websites, videos, or expert sources). You **found options to interact** on this site (e.g. there were comment box and email link to ask questions or leave comments, and options to share information from this site). On this site, your city has been identified as the outbreak location, but **no food(s) or restaurant(s)** involved in the foodborne illness outbreak are given.

Variation 10 - IQ

Now assume that you went online to look for information. In your search for more information, you found a **health department website.** There were **no functions that allow you to search for information** on this site (e.g. you did not find a search box or a site map of topics). You found some updates that were posted **daily.** **Links to relevant information outside the website weren't available** (e.g. there were no links to government websites, videos, or expert sources). You **did not find any options to interact** on this site (e.g. no comment box or email link to ask questions or leave comments, and no option to share information from this site). On this site, **both foods and restaurants involved in the foodborne illness outbreak are given.**

Please answer the following questions.

	Low 1	2	3	4	5	6	High 7
1. How would you rate the <u>trustworthiness</u> of this website?							
2. How would you rate this website for <u>information searching</u> ?							
3. How would you rate this website for its <u>ability to connect you with other sources of information</u> ?							
4. How would you rate the <u>ability to interact</u> on this website?							
5. What would you consider the <u>reliability</u> of this website to be?							
6. What would you rate the <u>ability to look for information</u> on this website?							
7. What is this website's <u>ability to provide you with information from other experts</u> ?							
8. What would you consider the <u>ability to communicate with others</u> on this website?							
9. How would you rate your <u>trust</u> of this website?							
10. How would you evaluate this website's " <u>searchability</u> "?							
11. How would you rate this website's <u>use of links to provide more information</u> ?							
12. How would you evaluate the <u>ability to exchange information</u> on this website?							

	Not adequate 1	2	3	4	5	6	Adequate 7
1. How would you rate the <u>frequency</u> of the updates?							
2. How <u>comprehensive</u> do you think the information on this website is?							
3. How adequate do you consider the <u>timeliness</u> of this website to be?							
4. Is there an <u>adequate amount</u> of information on this website?							
5. How <u>current</u> do you think the information on this website is?							
6. What is your rating for the <u>amount of detail</u> on this website?							

Now, suppose you looked up information on the website that was just described, please indicate the extent to which you agree or disagree with the following statements regarding your usage of the website.

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
1. I feel I am able to find the information regarding what foods and restaurants to avoid							
2. I believe that using the information on this website prevents me from getting sick							
3. I think getting to the information I need is easy on this website							
4. In my opinion, the information on this website appears to be good.							
5. I have the ability to locate the information I need to avoid the foods and restaurants that are involved in this outbreak							
6. The use of this website's information will help to protect me during this outbreak							
7. I feel the information I need is easily accessible on this website.							
8. I think this website has good quality information							
9. I am confident that I can find information to avoid the foods and restaurants involved in this outbreak							
10. I feel that the use of this website's information reduces my risk of getting sick during this outbreak							
11. I feel it is easy for me to find what I am looking for on this website							
12. I believe the quality of information on this website is high							

III. Intention

Please indicate the extent to which you agree or disagree with the following statements regarding your behavioral intention.

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
What would do you during this outbreak?							
I will use information on this website to make dining out decisions <u>during this outbreak</u>							
What would do you in the future?							
When there are other outbreaks <u>in the future</u> , I will use information on this website to make dining out decisions							

You are almost done! Just a few more questions to go.

IV. Food safety attitude

Please answer the following questions based on your personal beliefs about food safety. Please indicate the extent to which you agree or disagree with the following statements.

	Strongly disagree 1	2	3	4	5	6	Strongly agree 7
I am worried about the safety of food available today							
In general, I am worried about the safety of food in restaurants .							
I am interested in getting food safety information							
I want to know more about food safety							

Next, we have a few questions about your food safety practices.

1. Do you have a food thermometer, such as a meat thermometer?

Yes
No

V. Demographic characteristics

1. You are:
Female
Male
2. In what year were you born?

3. What is the highest level of education you have completed?

Less than high school

High school graduate (or equivalent)

Some college (1-4 years, no degree)

Associate's degree (including occupational or academic degree)

Bachelor's degree (BA, BS, etc.)

Master's degree (MA, MS, etc.)

Professional school degree (MD, DDC, JD, etc.)

Doctoral degree (PhD, EdD, etc.)

4. Which statement describes your household?

No children

Children under 6 years old

Children 6 years old and over

Other, please specify

5. In which state do you currently reside?

VITA

VITA

Jing Ma (Joy)

EUCATION

- | | |
|---|---|
| Purdue University
<i>Doctor of Philosophy in Hospitality and Tourism Management</i>
Advisors: Dr. Barbara Almanza and Dr. Richard Ghiselli | West Lafayette, IN
August 2016 |
| Thunderbird School of Global Management
<i>Master of Science in Global Management with highest distinctive honors</i>
Study Abroad: Global Institution study in Geneva | Glendale, AZ
Dec 2012
Spring 2012 |
| Purdue University Calumet
<i>Bachelor of Science in Accounting and Finance with highest distinctive honors</i> | Hammond, IN
May 2011 |

RESEARCH ACTIVITIES**Articles**

- Ghiselli, R., & Ma, J. (2015). Restaurant Social Media Usage in China: a Study of Industry Practices and Consumer Preferences. *Worldwide Hospitality and Tourism Themes*, 7(3).
- Ma, J., & Ghiselli, R. (2014). The Minimum wage, A Competitive Wage and the Price of a Burger: Can Competitive Wages be Offered in Limited-Service Restaurants?. *Journal of Foodservice Business Research*, 19(2).
- Ma, J., & Ghiselli, R. (2014). Measuring, Monitoring, and Managing the Green Practices in Mid-sized Restaurants in China. *Journal of Foodservice Business Research*, 19(1).
- Zhao, X., Colwell, J. L., & Ma, J. (2010). A Review of the Evaluation Methods of the Value of Human Capital of Manager in China. *International Business & Economics Research Journal*, 9(6).

Refereed conference proceedings

- Ma, J., Kim, J., Almanza, B.A. (2016). Inspectors' Preceptions of the FDA's Newest Restaurant Inspection Format. Paper presented at the 21st Annual Graduate Education & Graduate Student Research Conference in Hospitality and Tourism, Philadelphia, PA.
- Ma, J., Almanza, B., Ghiselli, R., & Vorvoreanu. M. (2016). *Communicating food safety information using social media*. Poster presented at the 21st Annual Graduate Education & Graduate Student Research Conference in Hospitality and Tourism, Philadelphia, PA.
- Kim, J., Ma, J., Almanza, B.A. (2016). Consumers' Preceptions of the FDA's Newest Restaurant Inspection Format. Paper presented at the 21st Annual Graduate Education & Graduate Student Research Conference in Hospitality and Tourism, Philadelphia, PA.
- Ma, J., Almanza, B., & Ghiselli, R. (2015). *Social Media's Potential as a Communication Tool for Health Departments Interested in Providing Food Safety Information to the Public*. Paper presented at the 2015 Annual ICHRIE Summer Conference, Orlando, FL.
- Ma, J., Almanza, B., Lee, J.-E., Ghiselli, R., Behnke, C., & Sydnor, S. (2015). *Foodservice design: Are restaurants meeting older consumers' preferences?* Paper presented at the 2015 Annual ICHRIE Summer Conference, Orlando, FL.
- Ma, J., Ghiselli, R., & Almanza, B. (2015). *Restaurant social media usage in China: a study of industry practices and consumer preferences*. Paper presented at the 2015 Annual ICHRIE Summer Conference, Orlando, FL.
- Ma, J., & Ghiselli, R. (2015). *Social networks in restaurants: a study of industry practices and consumer preferences*. Poster presented at the 20th Annual Graduate Education & Graduate Student Research Conference in Hospitality and Tourism, Tampa, FL.
- Kim, J., Ma, J., & Almanza, B. (2015). *Consumers' Perceptions of the FDA's Newest Recommended Restaurant Inspection Format*. Poster presented at the 20th Annual Graduate Education & Graduate Student Research Conference in Hospitality and Tourism, Tampa, FL.
- Ma, J., Almanza, B., Ghiselli, R., Lee, J.-E., Behnke, C., & Sydnor, S. (2015). *Foodservice Design: Are restaurants providing what older consumers prefer?* Poster presented at the 20th Annual Graduate Education & Graduate Student Research Conference in Hospitality and Tourism, Tampa, FL.
- Ma, J., & Ghiselli, R. (2014). *The Minimum wage, A Competitive Wage and the Price of a Burger: Can Competitive Wages be Offered in Limited-Service Restaurants?* Paper presented at the 2014 Annual ICHRIE Summer Conference, San Diego, CA.
- Ma, J., & Ghiselli, R. (2014). *Turnover In The Foodservice Sector: A meta-analysis research*. Paper presented at the 2014 Annual ICHRIE Summer Conference, San Diego, CA.
- Zhao, X., Ghiselli, R., & Ma, J. (2014). *The Relationship of Job Characteristics to Work and Life Attitudes Among Frontline Employees*. Paper presented at the 2014 Annual ICHRIE Summer Conference, San Diego, CA.
- Ma, J., & Ghiselli, R. (2014). *Measuring, Monitoring, and Managing the Green Practices in Mid-sized Restaurants in China*. Paper presented at the 19th Annual Graduate Education & Graduate Student Research Conference in Hospitality and Tourism, Houston, TX.

Zhao, X., Ma, J., & Wang, X.-l. (2010). *An empirical study on the effect of Chinese government's non-tax revenue spending on its GDP's growth*. Paper presented at the International Conference on Financial Theory and Engineering (ICFTE), Dubai.

Refereed under review

- Almanza, B.A., Ma, J., Ghiselli, R., Lee, J.E., Behnke, C., Sydnor, S., Park, H., and Kim, J. (2015). Foodservice design: Are restaurants meeting older consumers' preferences? *Journal of Foodservice Business Research*. (Under 2nd Review).
- Zhao, X.Y., Ghiselli, R., Law, R., Ma, J. (2015). Motivating Frontline Employees: Role of Job Characteristics in Work and Life Satisfaction. *Journal of Hospitality and Tourism Management*. (Under 1st Review).
- Ma, J., Almanza, B.A., Vorvoreanu, M. Social Media's Potential in Food Safety Communication. *Journal of Applied Communications*. (Under 1st Review).
- Kim, J., Ma, J., Almanza, B.A. Consumers' Preceptions of the FDA's Newest Restaurant Inspection Format. *Journal of Environmental Health*. (Under 1st Review).

Working papers

- Ma, J., Almanza, B.A., Ghiselli, R., Vorvoreanu, M., Sydnor, S. Improving online food safety communication: The role of media. (Dissertation)
- Ma, J., Kim, J., Almanza, B.A. Inspectors' Preceptions of the FDA's Newest Restaurant Inspection Format. (To be submitted in 2016)
- Ma, J., Almanza, B.A. Toward Safer Restaurants: An Analysis of Chinese Restaurateurs' Perception and Acceptance of Traceability Systems. (To be submitted in 2016)

Presentations

- Ma, J., Almanza, B.A. *Communicating food safety information using social media*. Indiana Environmental Health Association Wabash Valley Chapter Meeting. Lafayette, IN. February 04, 2016.
- Almanza, B.A., Ma, J., Kim, J. *Comparison of inspection formats: Inspectors' and consumers' opinions*. Indiana Environmental Health Association Food Protection Committee Meeting. Indianapolis, IN. July 31, 2015.
- Ghiselli, R., Ma, J. *Passing the Baton: The Next Generation of Travelers*. Nanjing Institute of Tourism & Hospitality. Nanjing, China. Oct. 27, 2014. (Invited)
- Ghiselli, R., Ma, J. *Passing the Baton: The Next Generation of Travelers*. International Tourism Branding and Communication Conference. Digital and Experiential Innovations in Tourism and Hospitality. Anhui Normal University, Wuhu, China. Oct. 24-25, 2014. (Keynote – Invited)
- Ghiselli, R., Ma, J. *Passing the Baton: The Next Generation of Travelers*. President's Back-to-Class. Purdue University, West Lafayette, IN. Oct. 10, 2014.
- Ghiselli, R., Ma, J. *GEN X and GEN Y – The Next Generation of Travelers*. Hoosier Hospitality Conference. South Bend, IN. March 12, 2014.

Ghiselli, R., Ma, J. *Six Apps to Use When Traveling Abroad*. President's Back-to-Class. Purdue University, West Lafayette, IN. Oct. 11, 2013

Ma, J. *A study of the usage of e-books: An application of importance-performance analysis (IPA)*. Student Research Day. Purdue University Calumet, Hammond, IN. March 31-April 1, 2011.

Ma, J. *Studying in America: A Milestone in the Life of an International Student*. 45th Annual Conference of the National Collegiate Honors Council. Kansas City, MI. Oct. 20-24, 2010.

Ma, J. *A Comparison study of domestic and international students' attitudes toward uses of credit at Purdue University Calumet*. Student Research Day. Purdue University Calumet, Hammond, IN. April 1-2, 2010.

EXPERIENCE

Teaching

Instructor – Purdue University, West Lafayette, IN Fall 2015

HTM 241 Managerial Accounting and Financial Management in Hospitality Operations

The course covers managerial and financial analyses of numerical data used for decision-making. Consideration of systems, techniques, information types, and presentational forms used by hospitality management. Emphasis on situations oriented to the hospitality industry.

- Independently developed all course materials.
- Instructed students and managed all grades.
- Incorporated online instruction to improve students' learning and engagement.

Teaching Assistant – Purdue University, West Lafayette, IN Spring 2015 and Fall 2014

HTM 181 Lodging Management (Lecture and Lab)

This course covers organization, management and operating procedures of lodging facilities along with current trends and cutting edge topics in the lodging industry, analyzes guest-employee interactions and discusses a history of the lodging industry.

- Independently managed the lab portion of the course (consulted with course professor weekly).
- Coordinated with hotel consultants to improve course design.
- Managed all grades.
- Shadowed the lectures.

Teaching Assistant – Purdue University, West Lafayette, IN Summer 2014

HTM 398: Food, Leisure and Hospitality Culture in China

HTM 372: Global Tourism Geography

Study abroad program.

- Facilitated the development and implementation of the program (e.g. designing itineraries, calculating budget, arranging the logistics).
- Promoted the program and recruited students.
- Assisted in identifying scholarships and additional funding.
- Accompanied students in China and, under the lead of the professor, managed the program.
- Served as translator.

Teaching Assistant – Purdue University, West Lafayette, IN

Spring 2014

HTM 291 Quality Food Production And Service

An introduction to food preparation methods and service techniques in quantity food settings. Students become familiar with ingredients and culinary terminology, and learn to read and evaluate menus. Recipe conversion and costing skills are developed. Different production schemes and product flow are examined, and the relationship between back-of-the-house and front-of-the-house activities is discussed.

- Prepared for and led students through their food labs, and evaluated students' performance and provided feedback.
- Knew safety procedures and provided a safe environment in which students can work.
- Learned how to guide students' thinking and dealt with questions without giving away the answers.

Teaching Assistant – Purdue University, West Lafayette, IN

Spring 2014

HTM 191 Sanitation And Health In Foodservice, Lodging, And Tourism

This course introduces students to the foodservice component of the Hospitality and Tourism industry and explores food safety and other health related issues. Application of sanitation principles in restaurants, hospitals, schools, hotels, cruise ships, airlines, and international travel are covered. A National Sanitation Certification Examination is required to receive credit.

- Assisted the professor (helped design the course, prepared course materials, and graded assignments and exams).
- Taught selected topics (e.g., Hazard Analysis Critical Control Points (HACCP), food supplies, travel health issues, food safety during and after disasters, and the flow of food).
- Constructed and improved, under the guidance of the course professor, different assessment components.
- Learned how to use iclicker and Respondus.
- Held office hours.
- Met with course professor weekly to discuss and learn effectiveness of different teaching techniques and how to improve student learning.

Teaching Assistant – Purdue University, West Lafayette, IN

Fall 2013

HTM 141 Financial Accounting for The Service Industries

Fundamental accounting principles and procedures applied to the hospitality and service industries. Includes study of the uniform system of accounts, financial statements, special purpose journals, and subsidiary ledgers unique to the hospitality and service industries.

- Assisted the professor (helped design the course, prepared course materials, and graded assignments and exams).
- Taught selected topics (e.g., overview of financial statements, statement of cash flow, financial statement analysis, receivables and payables, and internal control).
- Held office hours.
- Met with course professor regularly and discussed teaching techniques and philosophy.

Supplementary Instructor – Purdue University Calumet, Hammond, IN Fall 2009 - Spring 2011

- Assisted four different courses in finance, accounting, statistics and operation management.
- Held office hours, and tutor sessions twice a week (instructed and tutored about 70 juniors and seniors).
- Created, designed and implemented daily lesson plans to teach study habits, classroom etiquette, and time management.

Industry

Haihong Co. Ltd, Lanzhou, Gansu, China

Haihong is a restaurant and hotel managing and holding company headquartered in Lanzhou, China. The company holds 31 restaurants and 4 hotels in different provinces. The average annual turnover is around RMB10MM (USD2MM) for each restaurant and RMB15MM (USD2.5MM) for each hotel.

Food safety

June – August 2015, May - August 2014, January - June 2013

- Designed and implemented improved food safety control protocols –in both front and back of the house (e.g. established critical control points, tested equipment adequacy and layout efficiency, and improved flow of food) resulted in improved food safety controls.
- Planned and executed regular employee food safety trainings; translated and incorporated most current ServSafe® materials.

Operations

June – August 2015, May - August 2014, January - June 2013, April - June 2012, July - August 2011

- Improved menu design according to inventory, profit margin and best practices from the US, resulted in higher profits, better inventory control and higher customer satisfaction.
- Studied and created a range of new food items based on inspiration gained from food in the U.S., resulted in better customer attraction and retention and higher customer satisfaction.
- Improved layout of kitchen and seating areas, resulted in increased working efficiency, enhanced revenue potentials, and reduced service time.

Marketing (especially social media strategies)

June – August 2015, May - August 2014

- As part of a team, worked closely with consulting and software developing companies, designed, launched, and improved smartphone application for the company, resulted in a significant increase (3% the first month) in online and delivery orders.

- Developed and executed social media communication plans (e.g. developed and tested different messages and channels, conducted consumer surveys, held training sessions for marketing employees and so on), resulted in improved consumer engagement (e.g. more feedback collected, increased usage of coupons distributed online, increased sales volume during special events promoted through social media).
- Assembled new marketing plan specifically focusing on utilizing “pre-set menu” based on leanings from US restaurants such as Red lobster, Applebee’s and Friday, resulted in better inventory control, higher customer satisfaction and a number of other costs savings.

Accounting and finance

January - June 2013, July - August 2009, May - July 2008

- Analyzed financial statements, providing forecasts of future growth and recommendations to improve the budget for different restaurants, resulted in improved system efficiency and a reduction of operating costs (by 1%).
- Examined cost structure from both financial and managerial accounting perspective and utilized pricing principles, providing an overall plan to guide pricing decisions, resulted in a 2-3% higher profit margin on certain group of products and improved customer satisfaction.

Human resources

June – August 2015, December 2010 - January 2011, December 2009 - January 2010

- Reviewed adjustments made before, summarized lessons learned, and constructed plans for further improvement.
- Constructed plan on improving wage system, using enriched and more accurate assessment to adjust salary and rewards, resulted in highly motivated employees, improved working efficiency and higher employee loyalty.
- Improved employee evaluation system, requiring better planning and more communications and team building etc., significant reduced the short-sited and self-centered behaviors encouraged by the system before.

Event management

January - June 2013

- Formed new special event planning (wedding etc.) procedures based on ideas gathered from class discussions, resulted in higher quality banquets along with cost savings.
- Designed and promoted special events such as Valentine’s Day, Labor Day, and Father’s Day, resulted in positive word of mouth and increased revenue.

Deloitte Touche Tohmatsu Limited, Beijing, China

Deloitte, the largest professional services network in the world by revenue, provides audit, tax, consulting, enterprise risk and financial advisory services with more than 200,000 professionals in over 150 countries.

Auditor (internship)

June - July 2012

- Provided audits and reviews of financial statements and reporting on internal controls in compliance with professional standards with a team in fieldwork, resulted in truthful and accurate reporting appropriate for the upcoming public offering.
- Facilitated companies with their efforts to understand and comply with changes in accounting requirements in preparing financial statements and regulatory filings, resulted in better financial management system ensuring all financial records and documentations are eligible for public offering.
- Researched and learned accounting standards, corresponding changes as well as basic auditing principles.

White Lodging Services, Merryville, IN

White Lodging is one of the fastest-growing, fully integrated independent hotel ownership, development and hotel property management companies in the United States. It generates more than \$1 billion in revenue every year.

Internal auditor (internship)

May - August 2010

- Reviewed 95% of the company's daily transactions, audited the financial statements and tax related reports, and located and corrected any discrepancies, resulted in truthful and accurate reporting and tax savings.
 - Independently prepared tax returns for 20 hotels, resulted in timely and accurate report to IRS.
 - Researched laws and regulations in hospitality industry for multiple states, correctly applying complicated rules to maximize benefits and find errors, resulted in monetary savings and maintaining the company's reputation.
- Improved daily data collection process for hotels, resulted in enhanced communication among home office and individual hotels and more user-friendly worksheets.

HONORS & AWARDS

Member, Pi Sigma Alpha Honor Society	Fall 2012
Member, Beta Gamma Sigma Honor Society	Spring 2012
Recipient, Continuing Student Grant	Spring 2012
Student Speaker, Graduation Commencement	May 2011
Representative, Graduating class of 2011	May 2011
Recipient, Research in Management Award	April 2011
Recipient, Outstanding Student	2010 - 2011
Recipient, Dean's List and Semester Honors (every semester)	Fall 2008 - Spring 2011
First Place Recipient, Swan Citizenship Award	Spring 2010
Recipient, Above and Beyond Award for outstanding contributions to student organizations	Spring 2010