

Risk, privacy and security concerns in digital retail

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Abstract

This paper provides a review of various aspects of the digital retail environment to inform understanding of the antecedents and consequences of the main barriers towards consumer acceptance behaviour and to identify limitations in literature requiring empirical exploration. Through analysis of relevant secondary research, this paper draws on significance research findings and limitations and offers three important contributions for both academics and practitioners. First, it adds to the understanding of the roles of perceived risk, privacy and security concerns throughout the digital environment and, second, specifically recognises limitations in risk related research within online shopping literature. Finally, it indicates the potential consequences of the barriers identified providing a framework for future consideration, which informs the development of mobile shopping platforms and facilitates the establishment of mechanisms to defuse the barriers affecting m-shopping acceptance.

Keywords Digital retail, mobile shopping, consumer acceptance, perceived risk, privacy, security

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Introduction

Since the establishment of commercialised Internet in the 1990s, society has adapted to embrace the digital environment in many aspects of everyday life. Alongside the relatively fast establishment and utilisation of electronic commerce (e-commerce), the Internet has extended into the realm of mobile devices (Groß, 2015). Since the development of Smartphones, mobile commerce (m-commerce) has increased in popularity, providing consumers with an even more convenient, ubiquitous and reachable means of transacting business online (Jaradat & Rababaa, 2013; Lai & Lai, 2014; Pantano, 2016; Zhang, Chen, & Lee, 2013).

Digital commerce comprises of a variety of activities and services and literature has long examined digital retail, or online shopping (e-shopping), in both the electronic and mobile sectors (e.g. Gefen, 2000; Gefen, Karahanna, & Straub, 2003; Groß, 2015; Ingham, Cadieux, & Berrada, 2015); as online shopping systems are continuously developing throughout the years, literature exploring consumer adoption behaviours across various cultures and nations remains practically and theoretically relevant. Although the rate of digital retailing adoption is at an all-time high (Featherman, Miyazaki, & Sprott, 2010; Pappas, 2016), literature raises awareness to the dangers of engaging with online commercial activities.

With increased levels of e-shopping come heightened benefits of retailers collecting consumer data for marketing opportunities. However, the collection and storing of private consumer data increases the likelihood of hackers obtaining such information for fraudulent purposes and subsequently deters consumers from digital retail engagement (Aguirre et al., 2016; Bezes et al., 2016; Khan, Talib, & Faisal, 2015). Consumer uncertainties and concerns

stretch further to include lack of contact with sales persons (Shim & Lee, 2011), returning of products (Hong & Cha, 2013; Ramanathan, 2011), issues with the online purchasing process (Kim, Ferrin, & Rao, 2008), disclosing of confidential and financial information (Fram & Grady, 1997; Milne, Rohm, & Bahl, 2004), and protection of identity (Fogel & Nehmad, 2009), among others. Such concerns often result in consumers rejecting new retailing opportunities; those adopting a more in-store experience are less likely to convert to the online environment and those familiar with e-shopping are less likely to change to mobile mediums.

Although there is extensive research examining the effects of perceived risk, privacy and security concerns in e-shopping literature (e.g. Joubert & Van Belle, 2013; Nepomuceno et al., 2012; Nepomuceno et al., 2012), risk is primarily examined from a one-dimensional perspective. This literature review systematically reviews literature examining multi-dimensional, or multi-faceted risk in an attempt to provide a more in-depth understanding into the root cause of consumers' lack of digital retail adoption. Furthermore, as the majority of literature has derived from e-commerce and e-shopping literature, this review also aims to draw attention to research limitations surrounding risk in m-commerce research, in particular mobile shopping (m-shopping) research.

Scope of literature

As the purpose of this review is to provide an in-depth review of literature examining the effects of risk, privacy and security concerns digital retail, insight into e-commerce, e-purchasing, e-shopping, m-commerce, m-purchasing, and m-shopping is required. As far as the authors are

aware, no literature review has compiled risk-related research from multiple areas of digital retail from a multi-dimensional perspective alongside insight into privacy and security concerns.

To examine research across such a wide breadth of literature, rather than examining all existing e-commerce and m-commerce articles, this review focusses on two trends surrounding consumer acceptance/adoption behaviours in solely online environments and to the transacting of purchases by consumers. Achieving such a broad examination of literature has been challenging for previous reviews and remains demanding in this instance, thus requiring a structured approach to the collection and organisation of literature across various journals and disciplines.

Research methodology

The majority of articles considered in this review are published in major Information Systems and Marketing journals identified by performing keyword searches using *Google Scholar*, *EBSCO Business Source Complete*, and journal websites. Common terms used for keyword searches include: “perceived risk”, “risk”, “privacy”, “security”, “digital retail”, “online retail”, “electronic commerce”, “e-commerce”, “e-shopping”, “online shopping”, “mobile commerce”, “m-commerce”, “m-shopping”, which were applied in various structures, according to the author’s aims.

As consumers have been using the Internet to engage in online services since the early 1990s, e-commerce related literature has been included in this review from 1997 (Fram &

Grady, 1997), whereas m-commerce research has only become more relevant in recent years, preceding the development of Smartphones and Tablets, whereby this review only considers m-commerce articles published post-2003 (Sadeh, 2003). Therefore, this review examines literature across a 20-year time frame, thus requiring further classifications and restrictions of literature to provide a more concise review. This review systematically categorises literature according to three conditions; (1) e-commerce and m-commerce literature, with extended insight into more specific e-shopping, e-purchasing, m-purchasing and m-shopping articles; (2) research only examining consumer behaviour relating to adoption intention; and (3) risk-related research that considers overall risk, various types of risk, privacy concerns, and security concerns.

This stringent approach the literature is necessary as the digital retail environment encompasses a wide variety of online transactional activities and omitting sub-section research incorporating electronic and mobile banking, payments, auctioning, etc. is appropriate in maintaining focus. A comprehensive list of journal articles considered in this review is presented in Table I and lists the number of articles examined from various academic journals.

[Insert Table I about here]

Table I. Journals that have published more than two articles relating to risk, privacy and security concerns, and trust in e-commerce and m-commerce acceptance behaviour

Journal	No.
Computers in Human Behaviour	10
Journal of Consumer Marketing	8
International Journal of Information Management	7
Electronic Commerce Research and Applications	7
Information & Management	6
International Journal of Retail & Distribution Management	6
Decision Support Systems	5
Journal of Business Research	5
Journal of Interactive Marketing	4
MIS Quarterly	4
Association of Information Systems	3
International Journal of Human-Computer Studies	3
The Journal of Consumer Affairs	3
Journal of Electronic Commerce Research	3
Journal of Retailing and Consumer Services	3
IEEE Transactions on engineering Management	2
Industrial Management & Data Systems	2
Information Management & Computer Security	2
Information Systems Journal	2
International Journal of Electronic Commerce	2
International Journal of Service Industry Management	2
Qualitative Market Research: An International Journal	2
Other	45
TOTAL	136

Perceived risk, privacy and security in digital retail

Perceived risk is the notion that consumer behaviour involves an element of risk when consumers produce consequences of their purchasing actions, which, although cannot be anticipated with certainty, are likely to be unpleasant (Bauer, 1960, p. 24). To obtain a more multi-faceted lens, Jacoby and Kaplan (1972) provide six dimensions of risk, being financial, physical, psychological, social, time and performance. These ‘original’ risks have adapted over time to accommodate to a contemporary digital environment and are often extended to incorporate privacy and security concerns. A matrix depicting the relevance of various risks over time is displayed in Table II.

[Insert Table II about here]

Table II. Types of perceived risk associated with purchasing behaviour

<i>Type of risk</i>	<i>Definition</i>	Cunningham (1967)	Jacoby & Kaplan (1972)	Miyazaki & Fernandez (2001)	Forsythe & Shi (2003)	Featherman & Pavlou (2003)	Luo <i>et al.</i> (2010)	Nepomuceno <i>et al.</i> (2014)	<i>Revised definitions</i>
Financial	Risk that the product or service will not be worth the financial price	✓	✓	✓	✓	✓	✓	✓	Net loss of money to a consumer; includes the possibility that a consumer's credit card information may be misused
Psychological	The risk that the product or service will lower the consumer's self-image	✓	✓		✓	✓	✓	✓	Disappointment, frustration and shame experienced if consumer's personal information is disclosed
Physical	Risks to own or other's safety in using particular products or services	✓	✓	✓			✓	✓	Lack of face-to-face contact with shops/products results in fears of low product quality
Time (non-monetary)	Risk of the amount of time spent preparing shopping lists, travelling, seeking information, shopping and waiting for product delivery	✓	✓		✓	✓	✓	✓	Loss of time and inconvenience incurred due to difficulty of navigation, submitting orders, finding appropriate websites, or delays in receiving products
Performance (product)	Risk that the product or service will not perform as expected	✓	✓		✓	✓	✓	✓	Loss incurred when a product or service will not perform as expected; includes poor product choice due to online limitations
Social	The product or service choice may result in embarrassment towards their significant others	✓	✓			✓	✓	✓	Less important in digital retail as products/services are purchased privately, removed from social situations
Privacy	Control over the collection, use, access and release of their personal information			✓	✓	✓		✓	Control over collection, use, access & release of personal data
Security	Threat of destruction and/or modification of data, denial of			✓		✓		✓	The fear of being susceptible to fraud

	services, fraud, waste and abuse								
Overall risk	A general measure of perceived risk when all criteria are evaluated together					✓	✓	✓	A general measure of perceived risk when all criteria are evaluated together

Perceived risk

Perceived risk, or ‘risk’, exists throughout the digital environment and is of particular interest in digital retail; it is defined as “*a consumer’s belief about the potential losses or other negative outcomes from transacting on the Internet*” (Ingham et al., 2014, p.3) and creates consumer perceptions of uncertainty, riskiness, danger and negative repercussions comprising of threats to personal privacy and security (Biswas & Biswas, 2004; Kim et al., 2008; Lee, 2009; Li et al., 2012; Miyazaki & Fernandez, 2001; Pavlou, 2003; Zhu et al., 2011).

E-commerce relates to a networked information system, enabling buyers and sellers to exchange information and conduct in commercial transactions (Laudon & Traver, 2007; Varadarajan & Yadav, 2002). However, its examination extends only to use of computers, not to mobile devices. M-commerce, rather, give rise to heightened perceptions of risk due to mobile devices being a less mainstream means of shopping online, and has increased in academic consideration over recent years (e.g. Eastin et al., 2016; Joubert & Van Belle, 2013; Khan et al., 2015). Although risk perceptions vary according to product category (Laroche et al., 2010; Park et al., 2012), they often remain at the forefront of consumers’ minds, particular those new to using mobile devices for a wider variety of online activities (Hernández et al., 2010). Despite the effects of risk on m-commerce adoption intention have been explored since 2001 (e.g. Ghosh, 2001), the number of m-commerce articles exploring risk perceptions is inherently low with only one article examining risk in a multi-dimensional manner towards m-banking adoption (Luo et al., 2010) and one article examining multi-faceted risk towards brand strategies (Laroche et al., 2010). Thus, further exploration is required to better understand the effects of various risks on consumer adoption behaviour. Despite limitations in m-commerce

research, observations surrounding digital retail risks both in the electronic and mobile environments are explored and discussed collaboratively below.

The majority of e-commerce and m-commerce literature examining implications of risk in consumer acceptance behaviour examine such in a one-dimensional manner and have found risk to be a significant deterrent of acceptance behaviour (Kim et al., 2008a; Lim et al., 2008). This review, rather, primarily focuses on literature examining risk from a more multi-faceted perspective.

Financial, product and information risks are significant deterrents of e-commerce (Jacoby and Kaplan, 1972) and m-commerce (Luo et al., 2010) acceptance. Information risks concern transactional security and privacy and are prominently associated with disclosure of credit card information (Alharbi et al., 2013; Bezes, 2016); online disclosure of credit card details often provokes high levels of apprehension due to the prospect of credit card fraud (Andrews & Boyle, 2008; Biswas & Biswas, 2004). Psychological risks are also prominent in electronic and mobile commerce as the Internet is considered a primary violator of consumer privacy (Luo et al., 2010). Both financial and psychological risk perceptions can work collaboratively as potential financial losses cause disappointment and frustration (Forsythe & Shi, 2003). Although these observations and findings offer preliminary understandings into online transaction risk perceptions, they primarily concern e-commerce consumer behaviour. Furthermore, although e-commerce relates to a networked information system, enabling buyers and sellers to exchange information and conduct in commercial transactions (Laudon & Traver, 2007), its examination extends only to computers and not to mobile devices.

Aside from fears of fraud and misuse of information, physical risks are heightened when purchasing products online as the ability to touch, feel or try products is removed (Forsythe & Shi, 2003; Liu et al., 2013; Luo et al., 2010). Consumers are often hesitant to conduct in m-commerce as they are unable to have face-to-face contact with shops or products (Chong et al., 2012; Wu & Wang, 2006; Zhang et al., 2012b). Time is a risk for consumers as, although not monetary, is a time 'cost' and is prominent in the minds of consumers with either less Internet experience or low Internet frequency of use (Forsythe et al., 2006). However, these observations are becoming outdated and are methodologically and geographically constrained as the majority of quantitative findings derive from surveys distributed among University students from USA (Featherman et al., 2010; Forsythe & Shi, 2003; Stone & Grønhaug, 1993), Canada (Beatty et al., 2011) and Asia (Chong et al., 2012; Lee, 2009), which generally pre-date 2012. Accordingly, the influence of physical implications cannot be presumed to apply more widely to m-shopping consumer attitudes and actions as design limitations of mobile devices may indirectly impact on these reservations.

Due to lack of physical assurance with product specificity and quality (Dai et al., 2014), performance, or product, risks are prominent in digital retail (Biswas & Biswas, 2004; Garbarino & Strahilevitz 2004; Levin, 2005). Despite the effects of product risk on digital shopping acceptance having been examined against product categories, brands, and level of consumer experiences in the online shopping medium (e.g. Aguirre et al., 2016; Dai et al., 2014; Hamilton et al., 2016; Korgaonkar & Karson, 2007; Miyazaki & Fernandez, 2001), theoretical insight into it has diminished in recent years. Due to heightened fears mobile retailing, it is appropriate to further examine the effects of product risk when using smaller hand-held mobile devices to shop for particular products online.

The level of social risk experienced in digital retail is heavily dependent on cultures, societies and social groups (Hirunyawipada & Paswan, 2006; Weber & Hsee, 1998); for example, in a comparative study by Ko et al. (2004), Internet users from Korea felt higher levels of social risk than American users; whereas, a more recent study by Hong (2015), found social risks to be insignificant for Korean consumers. However, the various types of risk were examined as moderators in this instance and other contemporary studies maintain the significance of social risk in digital shopping research (e.g. Thakur & Srivastava, 2015). Research into social risk, alongside other risks, however, remains in its infancy, particularly regarding risk in mobile retail, requiring further theoretical and empirical analysis.

Literature examining digital retail risk perceptions occasionally does so alongside trust as online transactions often require consumers to disclose large quantities of personal and sensitive information to web-vendors (e-vendors) and mobile-vendors (m-vendors), causing them heightened levels of anxiety (Beatty et al., 2014; Bélanger & Hiller, 2006). Therefore, trust is a significant addition to risk research as it encourages technology acceptance, rather than deter it. Trust is a complex, multi-dimensional, context-dependent construct (Gefen et al., 2003), defined as a consumer's perception of the degree to which an exchanged partner will fulfil their transactional obligations in situations characterised by risk or uncertainty (Bailey et al., 2002).

E-commerce literature has explored the concept of trust for over 15 years and has found it to be a significant acceptance factor and a risk-reduction tool. Trust has been examined (1) multi-dimensionally, with or without risk (e.g. Belanche et al., 2014; Bianchi & Andrews, 2012; Hsu et al., 2014), (2) one-dimensionally without risk (e.g. Gefen, 2000), and (3) one-

dimensionally alongside risk (e.g. Nepomuceno et al., 2014); however, it is seldom considered multi-dimensionally alongside multi-dimensional risk. M-commerce literature investigating trust effects on acceptance behaviours often either (1) develop insight into ways to increase levels of trust, such as through design aesthetics (Li & Yeh, 2010), (2) examine trust transfer from electronic commerce to mobile commerce activities (e.g. Lu et al., 2011), (3) analyse trust as a risk reduction mechanism (Joubert & Van Belle, 2013), or (4) examine the effects of lack of trust as an additional barrier to acceptance behaviour (e.g. De Ruyter et al., 2002; Dahlberg et al., 2003; Joubert & Van Belle, 2013). However, the amount of research examining multi-dimensional trust against multi-dimensional risk is significantly low in both electronic and mobile contexts, which requires more attention to better explain consumer adoption intention of digital shopping.

Although trust is significant in online retailing situations (Joubert & Van Belle, 2013), literature has drawn more in favour for literary focus on risk, rather than on trust, as understanding consumer reservations better explains mitigation of concerns than further elaboration into trust (e.g. Featherman & Pavlou, 2003; Forsythe & Shi, 2003; Gefen et al., 2008). However, it remains a significant consideration within digital retail research and its omission from risk-related research may limit future research. A summary of findings and limitations across risk and trust research is displayed in Table III below.

[Insert Table III about here]

Table III. Summary of findings and limitations of risk and trust research in e-commerce and m-commerce literature

Research area	Research Focus	Findings	Limitations	Citations
E-commerce	Risk	Perceived risks negatively impacts on consumers' willingness to engage in online shopping activities	Risks are mostly explored in an overall manner rather than multi-dimensionally and findings from an electronic context cannot be presumed to apply to a mobile context	Biswas and Biswas, 2004; Izquierdo-Yusta and Calderon-Monge, 2011; Kim et al., 2008; Laudon and Traver, 2007; Lee, 2009; Li et al., 2012; Miyazaki and Fernandez, 2001; Pavlou, 2003; Varadarajan and Yadav, 2002; Zhu et al., 2011
		Financial risks are the most prominent risks in the minds of consumers, due to fears of credit card fraud	Observations are becoming outdated and are methodologically and geographically constrained	Andrews and Boyle, 2008; Biswas and Biswas, 2004; Jacoby and Kaplan, 1972
		Psychological risks are prominent in e-commerce as distance shopping can cause feelings of frustration and anxiety	Observations are outdated and only relate to e-commerce acceptance behaviour, rather than in the mobile sphere	Forsythe and Shi, 2003; Laudon and Traver, 2007; Luo et al., 2010
		Time risk is more prominent for consumers with less online shopping experience	Observations are becoming outdated and it can be recommended for time risk and experience to be explored in more detail across digital retail	Forsythe et al., 2006; Jacoby and Kaplan, 1972
		The level of social risk depends on cultures, societies and social groups	Research into social risk, remains in its infancy throughout the digital retail environment	Hirunyawipada and Paswan, 2006; Hong, 2015; Jacoby and Kaplan, 1972; Ko et al., 2004; Thakur and Srivastava, 2015; Weber and Hsee, 1998

		and can be a significant deterrent		
		Product risks are prominent concerns for consumers shopping for products online	There has been lack of theoretical insight into product risks in more recent years, with even less consideration into the effects in the mobile shopping environment	Biswas and Biswas, 2004; Dai et al., 2014; Garbarino and Strahilevitz 2004; Korgaonkar and Karson, 2007; Levin, 2005; Miyazaki and Fernandez, 2001
	Trust	Trust has been widely considered in e-commerce research and is found to be a significant influencer of acceptance behaviour	Literature has drawn more in favour for literary focus on risk, rather than on trust	Beatty et al., 2014; Belanche et al., 2014; Bélanger and Hiller, 2006; Chen et al., 2015b; Featherman and Pavlou, 2003; Forsythe and Shi, 2003; Gefen, 2000; Gefen et al., 2008; Lee and Turban, 2014; Palvia, 2009
M-commerce	Risk	Perceived risks are significant in the mobile sphere and considered more prominent than in an electronic context	More exploration is required to better understand the effects of different types of risks on consumer adoption behaviour	Eastin et al., 2016; Ghosh, 2001; Hernández et al., 2010; Jacoby and Kaplan, 1972; Joubert and Van Belle, 2009, 2013; Khan et al., 2015; Park et al., 2012
		Psychological risks are considered more prominent in the mobile environment	Limited empirical research has examined the effects of psychological risks on m-shopping acceptance behaviour	Forsythe and Shi, 2003; Laudon and Traver, 2007; Luo et al., 2010
		Physical risks are heightened in the mobile environment due to it being a less mainstream form of distance shopping	Has not been empirically explored with specific relation to mobile shopping	Chong et al., 2012; Jacoby and Kaplan, 1972; Wu and Wang, 2006; Zhang et al., 2012b

	Trust	Trust has been considered to a greater extent than risk in mobile related research and is a significant acceptance factor	Although defined as a multi-dimensional construct, trust is often considered in a one-dimensional way; mobile related research would benefit from examining various types of trust	De Ruyter et al., 2002; Dahlberg et al., 2003; Joubert and Van Belle, 2009; Joubert and Van Belle, 2013; Li and Yeh, 2010; Lu et al., 2011
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In analysing the implications of perceived risks on e-commerce and m-commerce acceptance behaviour, some main observations and themes arise. First, from 1993 to 2010 financial risks remain significant deterrents of electronic and mobile commerce (e.g. Luo et al., 2010; Stone & Grønhaug, 1993). Second, psychological risks are of secondary importance when deciding whether or not to conduct in online purchasing. Finally, risk-related research often incorporates insight into trust as a risk reduction and acceptance enhancing factor, yet often fails to examine either in a multi-dimensional manner. A consensus has also developed that although present within risk research, there has been sufficient lack of literature examining the effects of trust on perceived risks in relation to mobile related transactions, particular when either is explored multi-dimensionally, as supported by Table III.

Privacy and security concerns

For organisations to effectively compete in their markets, both traditionally and electronically, substantial quantities of customer data are required; with the increased accessibility and storage of electronic customer data, consumers express heightened privacy concerns (Groß, 2015; Palmer, 2005). ‘Privacy’ is the right to prevent disclosure of personal information to others through exerting control over its collection, use, access and release (Bélanger & Crossler, 2011; Bélanger et al., 2002; Peer & Acquisti, 2016; Rippé et al., 2016). Privacy concerns become prominent when information disclosure is requested, primarily due to fears that their information may be intercepted or misused (Aguirre et al., 2016; Roca et al., 2009). To maintain privacy, consumers must perceive themselves as having a level of control over information generated about them (Castañeda et al., 2007), often resulting in taking

preventative measures, such as information provision, fabrication and/or activity abandonment (Milne et al., 2004; Yang & Wang, 2009).

Privacy concerns are experienced across digital retail and have significant negative effects on online consumption behaviour (Gurău and Ranchhod, 2009; Khan et al., 2015; Li et al., 2012; Malhotra et al., 2004; Miyazaki & Krishnamurthy, 2002). As Internet transactions often involve information collection, sharing, use, reuse, and storage of transactions and personal customer information (Castañeda et al., 2007; Palmer, 2005), consumers often provide inaccurate or incomplete information (Paine et al., 2007; Roca et al., 2009), request removal from mailing lists, or engage in negative word-of-mouth (NWOM) (e.g. Yang & Wang, 2009). Thus, securing consumer information privacy assurance is significant in enhancing organisation reputation, customer relationships and customer confidence and trust (Alharbi et al., 2013).

Privacy anxiety primarily concerns information disclosure, protection and transaction intentions (Chong, 2013; Deng et al., 2010; Lai & Lai, 2014; Yang & Wang, 2009) due to fear of misuse of data, unauthorised access or modification of information by third parties (Chong, 2013; Deng et al., 2010; Lai & Lai, 2014). However, as geo-location technologies are prominent features in the majority of mobile devices, additional personal location and data and privacy concerns have emerged (Gurău & Ranchhod, 2009; Jiang & Yao, 2006; Vihavainen et al., 2009). The significance of location disclosure has been debated over the last few years as although consumers fear violation of their privacy (e.g. Wagner, 2011; Yang, 2016), the relationship between information disclosure intentions and actual disclosure is a weak one (Keith et al., 2013). Although this provides an initial understanding into the concept that

mobile service users' have an increased level of location privacy concerns, digital retailers require additional insight into a more specific purchasing context to leverage opportunities that mobile devices offer to marketers.

Literature examining implications of privacy concerns has primarily stemmed from e-commerce and m-commerce research, with significant lack of its consideration in m-shopping-specific research. However, the more heavily integrated organisations become in the mobile sphere, through shopping application (app) developments (Taylor & Levin, 2013), the more insight into consumer behaviour is required; consumers who are willing to provide personal data in a computer setting (e.g. Norberg et al., 2007) may not do so through the mobile medium, as obtaining applications apps through the Apple store or Google store is considered risky in itself, due to app credibility. Further research can examine the effects of particular app components on privacy concerns, such as app credibility, app payment, m-vendor reputation, app store set up and app request, as opposed to willing disclosure of sensitive information.

'Security', being the fear of being susceptible to fraud (Nepomuceno et al., 2014), often outweighs consumer perceived benefits of engaging in e-commerce activities (Andrews & Boyle, 2008; Bianchi & Andrews, 2012). Privacy and security concerns are often considered collectively as personal and private information must be protected by organisations through various security measures (Roca et al., 2009). This results in a privacy-security complex as consumers often have reservations towards initially divulging their personal private information and may subsequently lack confidence in the vendor protecting it (Alharbi et al., 2013; Andrews and Boyle, 2008; Roca et al., 2009; Zhang et al., 2013). It is therefore important for consumers to feel comfortable sharing private information whilst trusting the organisation

to provide adequate security for such as consumers experience higher levels of privacy risk when online transactions make credit card involvement mandatory (Alharbi et al., 2013).

Consumers experience anxiety when shopping online as security breaches are occurring more regularly and are often highlighted in the media and it becomes increasingly important for them to believe their sensitive information to be securely stored and inaccessible (Featherman et al., 2010). However, a major confidence gap exists regarding the security of connected devices between consumers and cyber security and informational technology professionals; inconsistent findings over time provide uncertainties surrounding actual effects of security concerns on m-shopping. Nevertheless, security concerns experienced by consumers are detrimental to organisations as the presence of security concerns often results in consumers providing organisations with limited, incomplete or inaccurate information with the aim to protect their information (Alharbi et al., 2013), subsequently affecting marketing strategies.

Assurance of consumer information privacy and data security has become significant in enhancing organisation reputation, customer relationships, and customer confidence and trust (Hung et al., 2012). Consumers often rely on organisation reputation as a determinant of privacy protection expectations; consumers often check security and privacy ratings of websites before buying online and reputation results are strong influencers of consumer confidence and willingness to make a purchase from the website (Alharbi et al., 2013; Kim et al., 2013). However, whether this behaviour is replicated in an m-shopping context regarding reliance on app ratings has not been examined to date, promoting further theoretical and practical consideration.

Despite privacy and security often being examined collaboratively (e.g. McCole et al., 2010), they are not necessarily comparable (Table IV). Rather, security concerns relate to being free from threats of fraud whereas privacy concerns relate controlling situations to reduce risks of being disturbed, observed or intruded by others. For example, security concerns may involve situations whereby consumers fear the safety of their personal information within a company database whereas privacy concerns relate to the fears of their inability to control the exploitation and sharing of their information (Alharbi et al., 2013; Rippé et al., 2016). Table IV draws attention to discrepancies towards differentiations between security and privacy concerns and demonstrates situations where they are considered collaboratively and when then are not.

[Insert Table IV about here]

Table IV. Similarity matrix between privacy and security concerns

Theme	Sources	Privacy	Security
An individual's control over the collection, use, access and release of their personal information	Bélangier and Crossler, 2011; Bélangier et al., 2002; Castañeda et al., 2007; Smith et al., 1996	✓	
Preventing disclosure of personal information to others	Westin, 1968	✓	
The unauthorised storing and sharing of personal consumer information from one company to another	Alharbi et al., 2013; Castañeda et al., 2007; Palmer, 2005		✓
Consumers experience higher levels of privacy risk when credit card involvement is mandatory	Alharbi et al., 2013; Castañeda et al., 2007; Milne and Boza, 1999; Palmer, 2005; Roca et al., 2009	✓	✓
Consumers fear the initial disclosure of their credit card information and trusting the vendor in protecting it	Alharbi et al., 2013; Chong, 2013a; Deng et al., 2010; Lai and Lai, 2014; Yang and Wang, 2009	✓	✓
Consumer manipulate the disclosure of personal information to protect it	Alharbi et al., 2013; Berendt et al., 2005; Lim, 2003; Paine et al., 2007; Roca et al., 2009; Yang and Wang, 2009	✓	

Fear of misuse of data, unauthorised access or modification of information by third parties	Abdul and Mohamed, 2008	✓	✓
Geo-location technologies and network security give rise to personal location and data and privacy concerns	Cheung, 2014; Decker, 2008; Jiang and Yao, 2006; Junglas and Watson, 2008; Vihavainen et al., 2009; Zhang et al., 2013	✓	✓
Information privacy and data security assurance enhances vendor reputation and consumer confidence and trust, and vice versa	Alharbi et al., 2013; Hung et al., 2012; Malhotra et al., 2004; Milne et al., 2004; Urban et al., 2012	✓	✓
Being free from threats	Castañeda et al., 2007		✓
Not being disturbed	Warren and Brandeis, 1890	✓	

Although security and privacy concerns are significant additions to risk-related research in e-commerce and m-commerce literature, their inclusion within m-shopping research remains in its infancy, with a number of research gaps arising. First, only a few articles address perceived security concerns over credit card information through mobile devices, providing limitations in theoretical and practical understanding. Second, although research has examined security concerns within the mobile environment, further research is required to analyse effects of network security concerns and examine implications of private and public locations on such (Zhang et al., 2013). Third, there is limited insight into the influence of trust as an uncertainty reduction mechanism (Hung et al., 2012), which can be explored further in security and privacy related m-shopping research. Finally, little regard has been taken into consumer security concerns deriving from wireless networks, when purchasing in a public place, requiring further attention.

Discussion and scope for further research

This review has analysed the effects of perceived risk, privacy and security perceptions in online shopping situations and has contributed to an overall understanding of what consumers fear in the digital environment whilst highlighting a number of research limitations and further research proposals. Despite the extensiveness of literature, research gaps have been identified and recommendations for further research been addressed.

Table V collaborates literature across e-commerce, e-purchasing, e-shopping, m-commerce, m-purchasing and m-shopping which examines risk, risk and trust, privacy

concerns, privacy and security concerns, and trust. The table reveals a lack of mobile related literature exploring various types of risk, with even fewer examining privacy and security concerns. Although discrepancies between the amount of electronic and mobile retailing literature may derive from how long each shopping method has been around for, further research is nevertheless required in the mobile sphere.

[Insert Table V about here]

Table V. Comparison table of e-commerce and m-commerce literature examining risk, privacy, security and trust

Research area	Type of research	No.	Sources
E-commerce E-purchasing E-shopping	Risk-related research	40	Andrews and Boyle, 2008; Belkhamza and Wafa, 2009; Bezes, 2016; Bhatnagar and Ghose, 2004; Biswas and Biswas, 2004; Chang and Tseng, 2013; Chen et al., 2015a; Chiu et al., 2014; Corbitt et al., 2003; Culnan, 1993; Cunningham et al., 2005; Dai et al., 2014; Faqih, 2013; Featherman and Pavlou, 2003; Featherman et al., 2006; Forsythe and Shi, 2003; Forsythe et al., 2006; Garbarino and Strahilevitz, 2004; Glover and Benbasat, 2010; Gupta et al., 2004; Hirunyawipada and Paswan, 2006; Iglesias-Pradas et al., 2013; Im et al., 2008; Korgaonkar and Karson, 2007; Liao and Cheung, 2001; Liebermann and Stashevsky, 2002; Lin, 2008; Lopez-Nicolas and Molina-Castillo, 2008; Masoud, 2013; Miyazaki and Fernandez, 2001; Musleh and Marthandan, 2014; Nepomuceno et al., 2012; Nepomuceno et al., 2014; Park et al., 2004; Ramanathan, 2011; Riek et al., 2016; Salam et al., 2003; Sutton et al., 2008; Thakur and Srivastava, 2015; Weber and Hsee, 1998
	Risk and trust research	22	Belanger et al., 2002; Bianchi and Andrews, 2012; Bryce and Fraser, 2014; Cho, 2010; Eid, 2011; Faqih, 2016; Faraq, 2011; Featherman et al., 2010; Flavian and Guinaliu, 2006; Fogel and Nehmad, 2009; Hong, 2015; Hong and Cha, 2013; Kim et al., 2008; Kim et al., 2010; Lian and Yen, 2014; Liao et al., 2011; Liu et al., 2005; Luo, 2002; Nicolaou et al., 2013; Olivero and Lunt, 2004; Pappas, 2016; Roca et al., 2009; Yang et al., 2015
	Privacy concerns	23	Ashworth and Free, 2006; Awad and Krishnan, 2006; Berendt et al., 2005; Brown and Muchira, 2004; Dinev and Hat, 2004; Graeff and Harmon, 2002; Hoffman et al., 1999; Hui et al., 2007; Hsu, 2006; Li, 2014; Milne et al., 2004; Miyazaki and Krishnamurthy, 2002; Nam et al., 2006; Nowak and Phelps, 1997; Pan and Zinkhan, 2006; Phelps et al., 2001; Preibusch, 2013; Smith et al., 1996; Ward et al., 2005; Wirtz et al., 2007; Wu et al., 2012; Xu and Gupta, 2009; Yang and Wang, 2009

	Privacy and Security concerns	3	Alharbi et al., 2013; McCole et al., 2010; Udo, 2001
	Trust related research	15	Beatty et al., 2011; Belanche et al., 2014; Chen et al., 2015b; Chen and Barnes, 2007; Chen and Dhillon, 2003; Deng et al., 2010; Gefen, 2000; Gefen et al., 2003; Hong and Cho, 2011; Kim et al., 2009; Koufaris and Hampton, 2004; Lee and Turban, 2014; Palvia, 2009; Yaobin and Tao, 2007; Zhang et al., 2014
M-commerce M-purchasing M-shopping	Risk-related research	5	Abu-Shanab and Ghaleb, 2012; Chen, 2012; Khan et al., 2015; Taylor, 2015; Thakur and Srivastava, 2014
	Risk and trust research	6	Chandra et al., 2010; Joubert and Van Belle, 2009; Joubert and Van Belle, 2013; Liebana-Cabanillas et al., 2014; Slade et al., 2015; Sreenivasan and Noor, 2010
	Privacy concerns	3	Eastin et al., 2016; Keith et al., 2013; Zhang et al., 2013
	Privacy and security	1	Ghosh and Swaminatha, 2001
	Trust related research	8	Cho et al., 2007; Lee and Ahn, 2013; Li and Yeh, 2010; Lin et al., 2011; Lu et al., 2011; Nilashi et al., 2015; Siau et al., 2003; Zhou, 2014

The majority of risk-related literature across digital retail derives from the electronic perspective, with a more restrictive approach to the mobile context (Zhang et al., 2013). Although consumer concerns surrounding various types of risk, privacy and security are prominent in the minds of less experienced online shoppers (Forsythe et al., 2006), research has failed to empirically examine the effects of risk and trust collaboratively, nor in a multi-faceted manner. Empirically establishing what types of risk and trust are the most significant and insignificant for consumers across geographical locations, shopping mediums and shopping situations is significant for enhancing both theoretical and practical understanding into consumer online shopping behaviours.

In obtaining a more in-depth understanding into what types of risk and trust have higher influencing power over adoption behaviours across digital retail, it is of theoretical and practical interest to understand differences in the effects of risk, privacy and security concerns between e-shopping and m-shopping behaviours. Comparison research will further develop insight into whether risks are more prominent in the electronic or mobile shopping environments, the results of which will provide more certainty and focus for retailers' marketing strategies and provide further advancements in knowledge if examined against product categories, brands and online vendors (Dai et al., 2014; Hamilton et al., 2016; Nepomuceno et al., 2014; Thakur & Srivastava, 2015).

It can be recommended for further work to examine the effects of risk and trust transfer between online shopping mediums. Although trust transfer has been explored between in-store and e-store literature (e.g. Bezes et al., 2015) and e-commerce and m-commerce acceptance literature (e.g. Lu et al., 2011), it has not been examined in respect to more specific electronic

to mobile shopping situations. Furthermore, risk transfer, being the perceived risks felt using one medium being transferred to another medium, has not been examined towards the specific online shopping context. Research exploring level of experience in online shopping may benefit from further insight into differences between positive and negative experiences and their effect on risk and trust transfer between shopping mediums.

A further recommendation is for research to adopt a more multi-dimensional lens to the digital shopping process, particularly towards perceived risks. Although concerns surrounding information disclosure are often heightened when is requested or made mandatory (Hillman et al., 2012; Hung et al., 2012; Zhou, 2013), such information is not required during preliminary browsing and searching stages; it can be recommended for further research to examine the varying levels of experienced risk, privacy and security concerns throughout the entire purchasing process, including the searching, browsing and comparing of products or services (Bezes et al., 2015).

Risks concerning personal and financial information retention, transfer and use are heightened within the mobile environment (Alharbi et al., 2013; Li et al., 2012; Zhang et al., 2013); however, examination into such has yet extended into the realm of m-shopping and, although a sub-section of m-commerce, m-shopping has been significantly under-research compared to other sub-sections of m-commerce, such as m-payments (e.g. Slade et al., 2015). Although a consensus exists, that disclosure of credit card information negatively affects risk, privacy and security concerns interchangeably in online shopping (Lai & Lai, 2014; Hillman et al., 2012; Hung et al., 2012), further research can examine the specific effects of credit card disclosure anxiety and develop understanding into anxiety reduction mechanisms in a mobile

retailing context. Furthermore, concerns surrounding credit card information disclosure generally derive from fears of organisation transfer or misuse of the information collected by m-vendors and obtained by hackers (Alharbi et al., 2013; Castañeda et al., 2007; Zhang et al., 2013). Insight into the effects of personal location on consumer willingness to conduct in m-shopping may establish a negative correlation between mobile credit card information disclosure and being in a public place using public Wi-Fi.

Research has also highlighted consumer demand for a level of control over their information and that the less control they have, the less likely they will engage in digital retail activities (Bélanger & Crossler, 2011; Castañeda et al., 2007; Rippé et al., 2016; Yang & Wang, 2009). It is therefore appropriate for theorists and practitioners to examine ways to increase perceived consumer control without negatively impacting the amount of valuable information obtained. However, there is limited empirical work examining trust in m-shopping acceptance, prompting further research to examine its effects on overall m-shopping risk reduction.

Limited empirical work examining m-commerce and m-shopping acceptance has been established using UK consumer data, with the majority of data deriving from Asia (e.g. Chong et al., 2012; Chong, 2013; Zhang et al., 2012a; Zhang et al., 2012b; Zhou, 2013) and USA (e.g. Eastin et al., 2016; Zhang et al., 2013), which can have potential negative implications on effective organisational marketing strategy and limits international competitiveness. Examining the effects of risk, privacy and security concerns on specific m-shopping acceptance behaviour in the UK will contribute to a cross-cultural analysis and understanding, and provide more specific consumer data. Furthermore, the majority of findings derive from surveys, which are primarily distributed and completed online (e.g. Beatty et al., 2011; Chong et al., 2012;

Featherman et al., 2010; Forsythe & Shi, 2003; Lee, 2009). Although surveys provide extensive amounts of quantitative data, adopting a one-dimensional methodological approach limits studies to within the confines of academic hypothesis. It can be recommended that alongside quantitative approaches, qualitative and/or experimental elements can be utilised (Groß, 2015) to limit bias and to ensure that every member of the target population is included in findings and resolve limitations regarding sample size as inclusion of additional and more extensive data collection methods would aim to achieve a more reliable sample size.

The ultimate retail goal is to enhance existing and new consumer engagement through developing exciting shopping experiences (Pantano, 2016); for organisations to increase retail successfulness and maintain market competitiveness, it is significant to establish a strong online presence to increase consumer purchasing opportunities. To further enhance a prominent online profile, retailers strive to expand to mobile mediums to provide them with additional marketing opportunities, which would otherwise be unachievable. Through analysis and discussion into the relationships consumers have with digital shopping methods and the potential deterrents towards their acceptance of such, practitioners may interpret and use findings to better assure consumers of their online safety. For example, if financial risks are of high consumer concern, it may be appropriate for retailers to develop more secure online payment processes. Furthermore, if consumers fear the specificity of products purchased online, it can be recommended for online retailers either to use traditional stores to send products for consumers to view face-to-face before completing the purchase, or to simplify the product returns processes.

Conclusions

The digital environment has long explored the effects of perceived risk, privacy and security concerns throughout various disciplines and the purpose of this review was to examine to what extent various types of risks and concerns effect consumer online shopping adoption behaviours and to identify areas requiring further exploration. There is a literary consensus that all types of perceived risks, established by Jacoby and Kaplan (1972), have significant yet varying levels of negative effects on consumer acceptance behaviour in both electronic and mobile contexts. However, the main observations of concern relate to (1) lack of research examining risk and trust multi-dimensionally, (2) limited empirical research comparing the effects of risk and trust between e-shopping and m-shopping acceptance behaviours, (3) lack of insight into barriers of acceptance of various stages of the online shopping processes, and (4) limited literature exploring risk, privacy and security concerns in m-shopping acceptance research.

This review contributes to the theoretical knowledge surrounding the digital environment in three ways. First, it evaluates the current literature examining online consumer behaviour and organises the knowledge into defined themes. Second, it recognises gaps in the existing research relating to m-shopping acceptance barriers. Finally, it indicates the potential consequences of the barriers identified providing a framework for future consideration, which informs the development of m-shopping platforms and facilitates the establishment of mechanisms to defuse the barriers affecting m-shopping acceptance.

Although this review provides a detailed review of literature across the digital environment, some limitations arise. Firstly, this review has paid particular attention to digital retail and has

identified research gaps present within the shopping ambit; research examining risk, privacy and security concerns within digital retail can develop findings further within different realms of the digital environment, such as banking. Secondly, this review considers literature from a consumer-based perspective, rather than a retailer perspective. As the majority of existing literature examines digital risk, privacy and security concerns from the perspective of consumers, it can be recommended for further research to explore their effects from the perspective of retailers. Finally, this literature review has reviewed established literature and made recommendations for further research but has not provided any empirical data confirming or rejecting the validity of such recommendations.

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