

Exploring consumers perceived risk and trust for mobile shopping: A theoretical framework and empirical study

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Abstract

Despite mobile device usage being at an all-time high, their utilisation for mobile shopping activities is inherently low. The study, first, identifies prominent areas of academic concern and examines areas requiring further insight. A theoretical model is developed to examine multi-faceted risk and trust effects on consumer adoption intention. Empirical results demonstrate several trust and risk perceptions as having varying effects on consumers' m-shopping intention. Inclusion of age and gender reveals discrepancies among positive and negative influencers of intention. Results contribute to theoretical and practical understandings surrounding deterrents of intention and potential risk-reduction mechanisms for future considerations.

Keywords: Mobile shopping, m-shopping, risk, trust, intention, gender, age.

1 Introduction

Worldwide utilisation of smartphones and tablets ("mobile devices") is at an all-time high with their use greatly stretching beyond the confines of basic communication. Mobile devices offer users with innovative and functional operation system enhancements which present them with an opportunity to develop alongside technological advancements and allows for a more convenient and efficient way of life (Groß, 2015b; Chen, 2013). M-commerce comprises a variety of online services accessible through mobile devices across mobile websites and applications (apps) (Zhang et al., 2013), providing consumers and retailers with enhanced

opportunities, faster access and greater accessibility (Nassoura, 2013), and has become one of the most conspicuous social changes within the last ten years (Groß, 2015a).

Mobile retail literature has drawn attention to the array of available m-commerce activities and has highlighted its three primary sub-sections, being mobile banking (m-banking), mobile payments (m-payments) and mobile shopping (m-shopping). M-banking concerns the use of mobile devices for managing finances (Shaikh and Karjaluo, 2015), m-payments concern the use of mobile devices to pay for products/services in-store (Slade et al., 2015), and m-shopping involves using mobile devices to search for, browse, compare and purchase products and/or services online (Groß, 2015b). Although all three areas demand further consideration, m-shopping is particularly under-researched and is subject to geographical constraints. For this research, m-shopping is defined as the online browsing, searching, comparing and purchasing of products/services through handheld mobile devices (Chong, 2013; Groß, 2015b; Marriott et al., 2017). Although this definition is similar to that for m-commerce, m-commerce is an umbrella term encompassing several types of mobile business, whereas m-shopping concerns only those relating to the purchasing process, particularly in business-to-consumer and consumer-to-consumer settings.

M-shopping has been in existence for over 15 years, with the first study exploring differences between traditional and m-commerce technology adoption in 2002 (e.g. Pedersen et al., 2002). Despite mobile devices being utilised for a variety of services, current m-shopping adoption rates are relatively low; South Korea has seen a fundamental growth of consumers' m-shopping adoption in recent years, from 12.6% in 2013 to 51.2% in 2016 (Statista, 2017a), with the USA currently showing a 41% adoption rate which is expected to increase to 46% in 2020 (Biggs et al., 2017). Despite m-shopping in the UK contributing £25bn in mobile retail venue in 2017 (Statista, 2017b), the UK remains comparably slower to respond to this transforming digital retailing environment.

M-shopping has increased in academic and practitioner attention since 2007, and literature concerning its adoption has surged since 2015 (Marriott et al., 2017). M-shopping literature primarily examines positive influencers of intention, such as perceived ease of use (e.g. Hubert et al., 2017; Ko et al., 2009; Wong et al., 2012), perceived usefulness (e.g. Agrebi and Jallais, 2015; Aldás-Manzano et al., 2009; Hung, Yang & Hsieh, 2012) and social influence (e.g. Lu et al., 2017; Wong et al., 2012; Yang and Forney, 2014), and has made significant contributions to this under-researched area. However, m-shopping adoption rates are lower

than expected and literature remains in its infancy regarding investigation into intention inhibitors. Although some research has developed insight into the role of risk and anxiety (e.g. Luarn and Lin, 2005; Natarajan et al., 2017; Wei et al., 2009; Yang, 2012), there is lack of understanding into the effects of risks towards m-shopping adoption intention, specifically, and there are repeated calls for further investigation in this under-developed area (e.g. Gao et al., 2015; Groß, 2015b; Yang, 2012).

Although the roles of risk and trust are beginning to be supported within m-shopping, e-commerce literature supports the multi-faceted treatment of risk and trust; although some studies have investigated the role of multi-faceted risk (e.g. Featherman and Pavlou, 2003; Suki and Suki, 2017) and trust (e.g. Lee and Turban, 2001), the number of mobile-related articles doing so is severely less, particularly in m-shopping. Work by Hubert et al. (2017) supports insight into several types of perceived risk in identifying financial risks as being particularly significant deterrents of m-shopping adoption behaviour.

With continuous support and calls for examination into the roles of risk and trust antecedents within this research context and geographical setting, the question is asked: *what factors contribute to consumers' overall risk and trust towards m-shopping intention?* Due to its convenience and accessibility, m-shopping has the potential to encourage spontaneous purchasing behaviour, subsequently increasing online sales margins and thus rendering the current lack of consumer engagement challenging for retailers. It is therefore important to investigate what factors specifically effect initial m-shopping adoption intention; this research aims to develop a risk and trust model to encompass a multi-faceted insight into risk and trust perceptions to aid digital retailers in shaping future m-shopping system developments and marketing schemes. To the best of the author's knowledge, no study has examined m-shopping intention from the perspective of multi-faceted risk and trust.

In response to existing research limitations and recommendations, this study encompasses dimensions of risk, as established by Jacoby and Kaplan (1972), and trust, as established by Lee and Turban (2001), into one conceptual model. Based on a dataset of 435 mobile shoppers, results of this study improve theoretical and practical understanding of factors effecting overall risk and trust, and subsequent behavioural intention, and their relevance across demographics. From a managerial perspective, results reveal which factors are primary deterrents of intention and which trust-enhancing mechanisms to consider.

The remainder of this paper is structured as follows: Section 2 provides a review of literature and discussion into theoretical foundation development. The research model and hypotheses development are then discussed in Section 3, followed by discussion into research method and data collection in Section 4. Data results and analysis are presented in Section 5 and discussed in Section 6. The conclusion is presented in Section 7 and draws on managerial and theoretical implications alongside research limitations and scopes for further research.

2 Literature review and theoretical foundation

2.1 Risk and trust in electronic and mobile commerce

Literature surrounding Information Systems, e-commerce, and m-commerce has long drawn attention to various antecedents contributing to academic and practitioner understanding into consumer adoption intention and highlights the significance of perceived risk and trust (e.g. Bezes, 2016; Chang and Wu, 2012; Chen and Dibb, 2010; Hubert et al., 2017). Although incorporation of risk and trust into technology acceptance research has been examined since the late 1960s and 1970s (e.g. Cunningham, 1967; Luhmann, 1979), more contemporary research highlight the relevance of improving understanding into both positive and negative effects on service-based intention.

Risk is frequently found a negative influence on overall consumers' intention across digital retail contexts; Kim et al. (2008) found risk to negatively affect US consumers' e-commerce purchase intention, whilst Liébana-Cabanillas et al. (2014) found risk the most significant negative influence on m-payment acceptance, and Chang et al. (2016) found risk a significant deterrent of Chinese consumers' e-shopping purchase intention. Although most literature supports the negative effect of risk on intention, some conclude otherwise; these insignificant findings often derive from research within the mobile sphere, particularly concerning m-shopping (e.g. Wong et al., 2012) and m-payments (e.g. Tan et al., 2014). Due to discrepancies across research settings and geographical contexts, it is important to continue considerations into the role of risk within under-researched areas of digital retailing, particularly m-shopping.

The positive role of trust in consumer behaviour is also supported across electronic and mobile retailing contexts. Both Al-Louzi and Iss (2011) and Alalwan et al. (2017) found trust to positively contribute to Jordanian consumers' m-commerce adoption intention, whilst

Chong et al. (2012) found trust significant towards m-commerce intention in China. As with risk, some empirical findings reveal trust to be immaterial towards consumers' intention, which is especially seen within m-commerce (Chong, 2013) and m-banking (Luo et al., 2010). Alongside discrepancies surrounding the role of trust on intention, its effect on perceived risk has also been debated. Trust is often found not only a significant influencer on intention but also a negative influencer of overall risk perceptions, particularly in e-commerce settings (e.g. Hsu et al., 2013; Kim et al., 2008). However, although some findings reveal trust to be significant on intention, they do not support its relationship with overall risk; for example, Slade et al. (2015) found trust to positively affect intention but have no relationship with UK consumers' overall risk towards m-payment intention. Others have found trust insignificant on both intention and perceived risk, such as Luo et al. (2010) who found US consumers to be uninfluenced by their trust towards m-banking risk perceptions or intention.

Despite risk and trust being considered collaboratively (e.g. Slade et al., 2015; Yang et al., 2015), examining them uni-dimensionally fails to provide sufficient understanding into consumer adoption intention. Rather, research increasingly finds merit in identifying more precise antecedents of risk and trust and indorse a more multi-faceted lens in consumer-based research (e.g. Belanche et al., 2014; Bezes, 2016; Hubert et al., 2017; Pappas, 2016; Suki and Suki, 2017). For example, Yang et al. (2015) examined eight antecedents of overall risk and found economic, functional and privacy risks to significantly enhance Chinese consumers' overall risk perceptions towards online payments. Furthermore, Zhou (2014) found m-vendor trust a highly significant influence on Chinese consumers' continuance usage of mobile internet services. Accordingly, as risk and trust are often expected to affect consumers' decision-making processes, it is more appropriate for further research to also examine which types of risk and trust influence intentions and behaviours; doing so will not only enhance theoretical understanding but also guide practitioners in marketing and system development efforts.

Although varying levels of risk are experienced across online and mobile channels and services, their precise effects differ across contexts, and are therefore non-interchangeable. For example, Luo, Zhang and Shim (2010) found financial risk the most significant predictor of US consumers' overall risk towards m-banking, whereas Suki and Suki (2017) found financial risk immaterial towards Malaysian consumers' online group purchasing attitudes. Furthermore, Lee and Ahn (2013) examined vendor trust against consumers' e-commerce and m-commerce intention; whereas vendor trust was insignificant in the e-commerce setting, it

was the most significant predictor of Korean consumers' m-commerce intention. These findings not only highlight contextual discrepancies but also geographical differences. As such, results from e-commerce and m-commerce research cannot be presumed to be reciprocated in the m-shopping sphere; neither results concerning consumers from countries such as China and USA can be presumed to be mirrored in a UK setting.

Establishing whether risk and trust are significant predictors of intention, alongside which types of risk and trust influence their overall perceptions, is required to better advise retailers on their appropriate distribution of resources. For example, if consumers fear financial information security when m-shopping, practitioners can more effectively improve their m-shopping systems or marketing strategies to assure consumers of monetary transaction safety. This is particularly relevant as not all risks and trusts are comparable across mobile services as, although all require levels of trust and risk, precise levels of such may differ amongst them.

2.2 Classification of mobile shopping

M-shopping literature is primarily divided into two categories, being (1) the mobile distribution channel, comprising of consumer-related acceptance perceptions and behaviours, and (2) mobile shopping systems, comprising of digital retail merchants adopting m-shopping system developments (Groß, 2015a; Marriott et al., 2017). Empirical research in the mobile distribution channel often examines intention and acceptance drivers concerning the benefits of m-shopping, in respect of mobile characteristics, usability and usefulness, consumer characteristics, relating to personal traits, circumstances and influences, and risk perceptions. Despite most research findings reporting significant effects of certain drivers, discrepancies have emerged among studies across contexts and geographical locations.

More recent m-shopping literature is beginning to develop understanding into more negative influencers of intention, particularly regarding perceived risk and anxiety (e.g. Groß, 2016; Gupta and Arora, 2017; Hubert et al., 2017). Despite exploration into more precise risk-related concerns in recent years (e.g. Groß, 2016; Hubert et al., 2017; Yang, 2016), a model identifying several antecedents of risk on overall risk, and subsequent intention, has not been designed to account for the m-shopping environment. Furthermore, although the role of trust has been supported in some m-shopping literature (e.g. Holmes et al., 2014; Hung, Yang and Hsieh, 2012), it is seldom examined as a multi-faceted construct, with only one model encompassing multiple antecedents of overall trust development towards m-shopping (see

Yang, 2016). Furthermore, although research is calling for more multi-faceted insight into risk (e.g. Groß, 2016; Hubert et al., 2017; Suki and Suki, 2017) and trust (Holmes et al., 2014; Suki and Suki, 2017; Yang, 2016), research has yet incorporated multi-faceted trust and risk antecedents against overreaching risk and trust perceptions to examine subsequent m-shopping intention, which has giving rise to fruitful avenues for further research (e.g. Agrebi and Jallais, 2015; Groß, 2016; Hubert et al., 2017; Marriott et al., 2017).

As proposed by Groß (2016), m-shopping research requires insight into a more elaborative risk perspective in respect to its singular impact alongside its antecedents to enhance its exploratory power. Studies by Yang et al. (2015) and Hubert et al. (2017) support further research validating the impact of different risk facets in a contextual setting. Furthermore, due to the infancy of m-shopping literature, recommendations encompass incorporating a more multi-faceted lens of trust (e.g. Hsu et al., 2014; Joubert and Van Belle, 2013). Although a research model examining possible influencers of overall trust in an m-shopping context has yet been established, literature often points to four influencers of trust, being trusting disposition alongside trust in the m-vendor, m-service, and m-device (e.g. Hsu et al., 2014; Joubert and Van Belle, 2013; Lee and Turban, 2001).

Alongside examination into the effects of multi-faceted risk and trust perceptions towards m-shopping adoption intention, identifying their effects on UK consumers also contributes to understanding in this research area further. Although UK consumers are proficient mobile device users, their current m-shopping adoption rate remains low, with only two UK-based studies examining their adoption intention (see Holmes et al., 2014; Hubert et al., 2017). As findings from other research areas and geographical settings support the multi-faceted treatment of risk and trust in consumer-based digital retailing, and commend their further insight, it is appropriate to examine their effects on UK consumers m-shopping adoption behaviour. This research subsequently targets an under-researched area within an under-examined geographical context with the aim to advance understanding for theorists and practitioners.

In undergoing an extensive systematic review of m-commerce and m-service literature, research reveals no theoretical model depicting/incorporating risk and trust antecedents having been established in the mobile sphere. This study combines three existing theories and frameworks to conceptual develop the research model. The conceptual model comprises of

risk and trust antecedents on overall risk and trust and the relationships between overall risk and trust on consumer behavioural intention.

2.3 Development of risk antecedents

Perceived risk is defined as consumers' expectation of losses associated with purchasing and acts as an inhibitor of purchase behaviour (Peter and Ryan, 1976), which is often heightened by feelings such as uncertainty, discomfort/anxiety, concern, psychological discomfort, and cognitive dissonance (Featherman and Pavlou, 2003). As observed by Hubert et al. (2017), m-shopping consumers often perceive a variety of concerns which are often context dependent (Campbell and Goodstein, 2001), thus supporting further examination into risk antecedents. Of the studies examining risk, most conceptualise their research models either fully or partly based on the study by Jacoby and Kaplan (1972). This study draws on the original six dimensions of risk, established by Cunningham (1967), comprising of financial, psychological, performance, physical, time, and social risks. However, Jacoby and Kaplan (1972) recognised the redundant nature of physical risks in the online environment and omitted it. Therefore, academic insight into the five dimensions of risk often take presence over the original six. Due to the independent nature of UK consumers decision-making and the regular omission of social risk from research models (Barnes et al., 2007; Faqih and Jaradat, 2015), social risk is also excluded from this study. Despite the merits surrounding inclusion of overall risk antecedents, m-shopping literature has seldom incorporated them into risk-related research. Yang et al. (2015) and Hubert et al. (2017) draw on the significance of considering financial, performance and security risk and find them all significant predictors of usefulness and ease of use perceptions. Despite Hubert et al. (2017) providing significant enhancements in the m-shopping sphere, their associations with the development of overall risk and subsequent intention are not explained in this study.

2.4 Development of trust antecedents

Trust is the accumulation of consumer beliefs of integrity, benevolence and ability which enhance willingness to depend on m-shopping (Gefen et al., 2003). Stemming from difficulties surrounding the definition of trust, Lee and Turban (2001) observe trust to be complicated and multi-faceted and support examination of trust antecedents alongside overall trust; they developed a trust model for consumer Internet shopping in identifying three dimensions of

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trust, being trustworthiness of Internet merchant, trustworthiness of Internet shopping medium, and individual trust propensity, alongside ‘contextual’ and ‘other’ factors. It is appropriate to adapt these trust antecedents to fit the m-shopping environment. To validate the use of Lee and Turban’s (2001) trust model, a systematic examination into the role of trust elements was conducted. Through examination into research surrounding the digital retail environment, 38 articles examining trust from a more multi-faceted perspective were identified. Table 1 reveals several terms used across research contexts that conform to four over-reaching antecedents of trust, being trust in m-vendor, m-service, m-device, and disposition trust. Therefore, the trust antecedents of m-vendor trust, m-service trust and disposition trust were adopted from Lee and Turban (2001) with m-device trust providing a contextual dimension.

Table 1 Development of trust antecedents

Used terms	References	Developed construct
Company reputation Vendor Institution Contact Customer service	Chandra et al., 2010; Chiu et al., 2009; Hsu et al., 2014; Jayawardhena et al., 2009; Joubert and Van Belle, 2013; Koufaris and Hampton-Sosa, 2004; Li et al., 2012; McCole et al., 2010; Siau et al., 2003; Thakur, 2014; Yaobin and Tao, 2005	M-vendor Trust
Information quality Website Internet System E-service Wireless services Structural assurance	Belanche et al., 2014; Chandra et al., 2010; Chiu et al., 2009; Cho et al., 2007; Hsu et al., 2014; Joubert and Van Belle, 2013; McCole et al., 2010; Siau et al., 2003; Suki and Suki, 2017; Teo et al., 2008; Yang, 2016; Zhou, 2013, 2014	M-service Trust
Technology Usability Perceived control Security control Design M-device technology Responsiveness	Chen and Barnes, 2007; Chiu et al., 2009; Jayawardhena et al., 2009; Koufaris and Hampton-Sosa, 2004; Lee et al., 2015; Li and Yeh, 2010; Nilashi et al., 2015; Roca et al., 2009; Siau et al., 2003; Thakur, 2014; Yaobin and Tao, 2005	M-device Trust
Personal trust Propensity to trust Disposition trust	Bianchi and Andrews, 2012; Chen and Barnes, 2007; Jayawardhena et al., 2009; Li et al., 2012; Liao et al., 2011; Rouibah et al., 2016; Yaobin and Tao, 2005	Disposition Trust

3 Research model and hypotheses development

The hypotheses development comprises of hypotheses based on two theoretical models and three core relationships between (1) overall risk and trust on behavioural intention, (2) the

influence of five types of risk on overall risk, and (3) the influence of four types of trust on overall trust.

3.1 Antecedents of intention

Perceived risk is one of the most widely recognised barriers in technology acceptance research (e.g. Rose et al., 2011; Wong et al., 2012; Zhang et al., 2012). Although perceived risk is briefly mentioned in m-shopping articles (Agrebi & Jalliais, 2015; Holmes et al., 2014; Hung et al., 2012; San-Martin and López-Catalán, 2013; Ström et al., 2014), its empirical examination in this context remains in its infancy. Due to its established negative effect on intention and the infancy in its application to the m-shopping sphere, it is hypothesised that:

H1a: Overall perceived risk negatively effects consumer m-shopping intention.

The role of initial trust is established across the digital retail sphere and is generally empirically tested either as an independent variable (e.g. Benamati et al., 2010; Lin et al., 2011; Luo et al., 2010; McCole et al., 2010; Slade et al., 2015) a moderator (e.g. Faqih, 2011; Gefen, 2000; Gefen and Straub, 2004; Kim et al., 2013; Srivastava et al., 2010; Zhang et al., 2014) or mediator (Gao et al., 2015; Yang et al., 2015) on various antecedents of acceptance behaviour. Although trust perceptions are found to generally higher for younger women, literature finds that level of experience has substantial implications on overall trust perceptions (e.g. Lin et al., 2011; Porter et al., 2012). Therefore, as this research primarily consists of consumers with at least some m-shopping experience, it is hypothesised that:

H1b: Trust positively effects consumer m-shopping intention.

Trust plays an essential role within the Internet purchasing process, in which perceived risk has a negative effect (Hung et al., 2012; Yang et al., 2008). Individuals with higher levels of trust are more willing to disclose personal information for online transacting purposes as trusting beliefs often outweigh risk concerns (e.g. Deng et al., 2010; Gefen et al., 2003; Groß, 2016; Kim et al., 2008; Lu et al., 2011; Slade et al., 2015; Wu et al., 2012). In contrast, lack of a trust in a technology often results in consumers refusing to disclose information when they fear for their personal and private information (Dinev and Hart, 2006). Therefore, maintaining a degree of control over the disclosure of consumers' information can reduce perceived risks and it is hypothesised that:

H1c: Trust negatively affects consumer perceived risk of m-shopping in the UK.

3.2 Antecedents of risk

Financial risk is more traditionally defined as the “potential monetary outlay associated with the initial purchase price as well as the subsequent maintenance cost of the product” (Grewal et al., 1994) and has more recently been adapted to include the recurring potential for financial loss due to fraud, dubious payment modalities, and undelivered goods (Featherman and Pavlou, 2003; Ferri et al., 2013; Groß, 2016; Hong and Cha, 2013; Jacoby and Kaplan, 1972). Both Cunningham (1967) and Jacoby and Kaplan (1972) find financial risk to be a significant deterrent of intention and has been supported across research contexts. Financial risks are more prominent in the online environment as transactions are remote, thus involving no face-to-face contact between consumers and retailers (Bezes, 2016; Biswas and Biswas, 2004; Cases, 2002; Eggert, 2006; Hubert et al., 2017). Therefore, it is hypothesised that:

H2a: Financial risk has a significant contributory influence of overall perceived risk. Psychological risks relate to the risk that the selection or performance of the producer will have a negative effect on the consumer’s peace of mind or self-perception (Mitchell, 1992) and is defined as the potential loss of self-esteem or ego from the frustration of not achieving a purchasing goal (Jacoby and Kaplan, 1972). Psychological risks are often associated with lack of experience; consumers who are unfamiliar with online shopping activities are more likely to become subjected to mental discomfort and fearing making wrong choices (Bezes, 2016; Hong and Cha, 2013; Laroche et al., 2004). However, the more experienced users are in using m-shopping, the more perceived control they develop as they feel they can control or omit risks than those with no experience (Hubert et al., 2017). As m-shopping is particularly under-utilised in the UK, it is hypothesised that:

H2b: Psychological risk has a significant contributory influence of overall perceived risk.

Performance risk is defined as the “possibility of the product malfunctioning and not performing as it was designed and advertised and therefore failing to deliver the desired benefits” (Grewal et al., 1994). Performance, or “product”, risks are considered much higher in the online environment as the distance shopping prevents consumers from accurately being able to judge the quality of products purchased which may result in the product purchased not performing up to their expectations (Bezes, 2016; Biswas and Biswas, 2004; Hassan et al., 2006; Hong and Cha, 2013). Literature also draws on performance risk deriving from fears of deficiencies or malfunctions of websites of applications whereby system breakdowns during

transactions, which can result in substantial losses (Hubert et al., 2017; Kuisma et al., 2007; Lee, 2009). As product risks are considered more prominent in the mobile environment (Hubert et al., 2017), it is therefore hypothesised that:

H2c: Performance risk has a significant contributory influence of overall perceived risk.

Despite the high levels of convenience that m-shopping offers to consumers, time risks remain prominent in the minds of consumers. Time risk in this instance comprises of consumer fear surrounding wasting time switching from more mainstream online shopping methods to doing so with mobile devices, therefore resulting in more time pressures (Bezes, 2016; Featherman and Pavlou, 2003; Featherman and Wells, 2004; Jacoby and Kaplan, 1972; Lu et al., 2011; Martins et al., 2014; Nepomuceno et al., 2014; Pappas, 2016; Thakur and Srivastava, 2015; Yang, 2016). It can therefore be hypothesised that:

H2d: Time risk has a significant contributory influence of overall perceived risk.

3.3 Antecedents of trust

Disposition trust, or “propensity to trust” (e.g. McKnight et al., 2002; Oliveira et al., 2014), refers to a person’s tendency to trust others and is defined as the general inclination which people show faith or belief in humanity and adopt a trusting stance towards others (McKnight et al., 2002). In the context of online purchasing or transaction situations, a consumers’ trusting disposition is considered more important for inexperienced consumer’s intention (Luo et al., 2010), particularly in unfamiliar situations (Johnson-George and Swap, 1982; McKnight et al., 1998). There is substantial evidence supporting the inclusion of disposition trust as a positive antecedent of overall trust in e-commerce (Chen and Barnes, 2007; Gefen, 2000; Gefen et al., 2003; Kim et al., 2008; Lee and Turban, 2001; Liao et al., 2011; Rouibah et al., 2016; Yaobin and Tao, 2005) and it is therefore hypothesised that:

H3a: Disposition to trust has a significant contributory influence of overall trust.

Trust in a mobile vendor (m-vendor) is essential for consumers to trust engaging in m-shopping activities; the more trusting consumers are in the m-vendor, perceived risks associated with financial concerns are found to reduce (Beatty et al., 2011; Olivero and Lunt, 2004). If consumers feel that m-vendors are opportunistic and unpredictable, their levels of trust reduce, therefore lowering their overall intention to engage in m-shopping activities (Hong and Cha, 2013). Therefore, when examining m-vendor trust it is appropriate to examine the level in

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which consumers find them trustworthy, interested in consumer well-being, and reliable when provided with financial details (Amin et al., 2014; Belanche et al., 2014; Gefen, 2000; Hong and Cha, 2013; Kim et al., 2013; Nicolaou et al., 2013). As its validity is validated across research contexts (e.g. Belanche et al., 2014; Chen and Barnes, 2007; Hsu et al., 2014; Joubert and Van Belle, 2013; McCole et al., 2010; Pappas, 2016; Suki and Suki, 2017; Zhang et al., 2014; Zhou, 2014), it is hypothesised that:

H3b: M-vendor trust has a significant contributory influence of overall trust.

Trust in a mobile service (m-service), in this instance being m-shopping, relates to the favourable attitudes towards m-shopping websites or applications that facilitates efficient and effective shopping, purchasing and delivery (Zeithaml et al., 1996). The primary reason consumers choose not to engage in online shopping activities is due to lack of trust in electronic transactions, and that in circumstances involving continuance intention, m-service trust is fundamental (Hung et al., 2012; Liu et al., 2005). It is appropriate to examine the level of trust exerted through reliability perceptions between online and mobile shopping systems. Based on existing literature (e.g. Belanche et al., 2014; Chiu et al., 2009; Hsu et al., 2014; Joubert and Van Belle, 2013; Lu et al., 2011; Martín et al., 2011; Suki and Suki, 2017; Yang, 2016; Zhou, 2014), it is hypothesised that:

H3c: M-service trust has a significant contributory influence of overall trust.

To examine trust in mobile devices, it is appropriate to analyse research examining trust in technology. Many studies examining trust in technology examine such in relation to websites and the Internet and find that if consumers are concerned about the technology not providing adequate security over their private and personal information they will not use it (Belanche et al., 2014; Teo et al., 2008). Many mobile-related studies have identified that prominent concerns in using m-devices derive from fears that they are not well equipped to dealing with transaction-processing; as m-shopping is primarily used on-the-go, the possibility of mobile data connection getting lost during online payment is likely, resulting in higher potential for transaction error (Ferri et al., 2013; Groß, 2016; Yang et al., 2015). As Smartphones and Tablets are Internet-enabled mobile devices and due to there being sufficient lack of specific trust in mobile technology research, it is appropriate to develop m-device trust hypothesis from technology trust research. It is therefore hypothesised that:

H3d: M-device trust has a significant contributory influence of overall trust.

3.4 Role of age and gender

Despite some studies reporting no behavioural intention differences between ages and genders (e.g. Faqih and Jaradat, 2015; Yang et al., 2015) understanding into risk and trust can be further enhanced through examination into consumer demographics; for example, Natarajan, et al. (2017) highlight the significance of developing understanding into moderating effects of age and gender. Furthermore, studies by Lian and Yen (2014), Suki and Suki (2017) and Gupta and Arora (2017) amplify the importance of examining age and gender on overall risk and its antecedents on intention, with Yang et al. (2015) supporting their inclusion in respect to trust and its antecedents.

Gender often has a significant effect on consumers' perceived risk and trust; for example, Faqih (2016) found that women exhibited lower trust and higher risk levels than men towards their intention to use the Internet for making purchases. Although this is frequently established in an electronic setting, its moderating effect on risk and trust has not been examined within the m-shopping sphere, nor within a UK setting. Age is also found to be significant when concerning technology adoption as younger consumers are considered more technologically proficient, due to being born within the digital era (Pieri and Diamantinir, 2010).

Although segmentation of age categories is often examined through identifying “young adult” and “(older) adult” consumers (e.g. San-Martín et al., 2015), Parment (2013) found discrepancies between Generation Y and Baby Boomers relating to their trust perceptions towards vendors when choosing a product and recommends segmenting age according to generations, as doing so enhances understanding of consumer behaviour, purchase patterns and strategic marketing implementations. This research primarily concerns examining the roles of multi-faceted risk and trust on UK consumers' m-shopping adoption intention and is the focus of this paper. Due to increased attention into the significance age and gender in contemporary digital retail literature, it is significant for this research to examine their effects in this instance. As the focus of this paper concerns the relationships between the independent and dependent variables within the research model, the effects of age and gender will be treated as control groups, rather than included within the hypotheses, which is supported from previous studies (e.g. San-Martín et al., 2015; Yang et al., 2015).

4 Research method and data collection

4.1 Data collection and sample

The data obtained for this research was collected in the United Kingdom through online and face-to-face survey distribution techniques. Prior to data collection, a minimum sample size threshold of 180 was calculated to account for 15 times the number of predictors, being 12 in this instance. A minimum sample size of 200 is recommended for studies adopting Structural Equation Modelling (SEM) techniques (Hoelter, 1983). Therefore, a minimum of 200 respondents was set, comprising of existing online shoppers and mobile device users, and random sampling procedure was adopted. It was necessary to target existing online shoppers to gain a more accurate understanding into intention deterrents of m-shopping that are not experienced in the online shopping sphere.

To encourage participation, respondents were offered the opportunity to enter a monetary raffle prize upon completion of the survey, of which one winner was selected at random. Prior to survey questions, participants were informed of the purpose of the study and were given a definition of m-shopping to go by during survey completion. To further ensure respondent familiarity with what constitutes “m-shopping”, each set of statements were introduced by a question, whereby keywords such as “browsing and purchasing” and “products and services” were used to reiterate the scope of the research topic. Survey responses were collected online and face-to-face over 5 weeks; online surveys were collected through social media and email distribution, using Qualtrics, and face-to-face surveys were distributed by the researchers to members of the public and university students.

Upon data evaluation and cleaning, of the 500 responses collected, a total of 435 responses are usable for this study, giving rise to 87% response rate. Of the 435 participants, 197 (45.3%) were male and 234 (53.8%) were female, with only 4 (0.9%) preferring not to say. Of the 435 respondents, 330 (75.9%) are in generation Y (18-35 years old), 70 (16.1%) are in generation X (36-51 years old), and 35 (8.0%) are baby boomers (over 52 years old). Therefore, most respondents were between 18 and 23 years old ($n = 191$, 43.0%) in full time employment ($n = 179$, 41.1%) with lower-end salaries ($n = 287$, 66%), giving rise to a sample primarily comprising of “young professionals” (Table 2).

Table 2 Sample demographics

Variable	Group	Frequency	Percent
Gender	Male	197	45.3
	Female	234	53.8
	Prefer not to say	4	0.90

Age	18-23	191	43.9
	24-29	120	27.6
	30-35	19	4.4
	36-41	21	4.8
	42-46	22	5.1
	47-51	27	6.2
	52-56	24	5.5
	57-61	8	1.8
	62+	2	.7
Employment status	Full time employment	179	41.1
	Part-time employment	37	8.5
	Student	142	32.6
	Student with part-time job	52	12.0
	Unemployed	9	2.1
	Retired	3	.7
	Other	12	2.8
	Prefer not to say	1	.2
Annual salary	£0 - £30,999	287	66.0
	£31,000 – 101,000+	65	14.9
	Prefer not to say	22	5.1
	N/A	61	14.0

4.2 Instrument development

Instruments are drawn from established works and adapted for this research context. Trust is measured using four items adapted from technology and mobile related research, with perceived risk items taken from various information technology and mobile payment literature, the most influential being from Featherman and Pavlou (2003). Intention is measured using items from Venkatesh et al. (2012). Construct items are tested using a 7-point Likert scale ranging from (1) Strongly Disagree to (7) Strongly Agree. The final items used in the survey questionnaire and their sources are listed in Appendix A.

5 Data analysis and results

5.1 Construct validity and reliability

To address convergent validity of the constructs, individual item loadings are required to be above 0.50 for adequate and 0.70 for excellent validity scores. Furthermore, to ensure construct validity, the Average Variance Extracted (AVE) scores are required to be above 0.50. To establish discriminant validity, the square root of the AVE for a construct should be higher than the shared variance between all constructs in the measurement model. Table 3 shows the items used for each construct along with the Cronbach's alpha values, Composite Reliability (CR)

and AVE scores and reveals all constructs to be reliable for this research in satisfying the established thresholds of $>.70$ for alpha values, $>.70$ for CR values (Nunnally and Bernstein, 1994), and $>.50$ for AVE values (Fornell and Larcker, 1981). Furthermore, Table 4 displays the inter-construct correlations to identify discriminant validity and reveals all standardised factor loadings to be above the recommended $>.50$ threshold (Gefen et al., 2000) and the correlations to be highest for the intended constructs. As such, no convergent or discriminant validity concerns are displayed, thus rendering the data suitable for further analysis.

Table 3 Reliability and Composite Validity of Constructs

Construct	Items	Standardised item loadings	Alpha	CR	AVE
Intention	BI2	.903*	.892	0.892	0.805
	BI3	.892*			
Perceived risk	PR2	.870*	.900	0.902	0.755
	PR3	.838*			
	PR4	.898*			
Financial risk	FR1	.810*	.848	0.868	0.688
	FR2	.859*			
	FR4	.819*			
Psychological risk	PsyR1	.895*	.948	0.948	0.860
	PsyR2	.950*			
	PsyR3	.936*			
Performance risk	PerR2	.816*	.700	0.708	0.551
	PerR3	.661*			
Time risk	TM2	.682*	.820	0.826	0.614
	TM3	.836*			
	TM4	.825*			
Trust	TR1	.877*	.882	0.882	0.790
	TR2	.900*			
Disposition trust	TD1	.752*	.782	0.787	0.650
	TD2	.855*			
M-vendor trust	VT2	.880*	.818	0.823	0.700
	VT3	.791*			
M-service trust	ST1	.838*	.858	0.907	0.765
	ST2	.874*			
	ST3	.908*			
M-device trust	DT2	.880*	.906	0.908	0.832
	DT3	.942*			

* $p < .0001$

Table 4 Discriminant validity of measurement model

TM	PR	PsR	ST	TR	DT	FR	VT	PeR	TD	BI
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TM	0.783										
PR	0.495	0.869									
PsR	0.598	0.635	0.927								
ST	-0.429	-0.607	-0.497	0.874							
TR	-0.362	-0.505	-0.385	0.721	0.889						
DT	-0.283	-0.641	-0.425	0.873	0.748	0.912					
FR	0.408	0.654	0.593	-0.445	-0.321	-0.430	0.829				
VT	-0.258	-0.597	-0.413	0.805	0.790	0.819	-0.384	0.837			
PeR	0.621	0.622	0.717	-0.398	-0.278	-0.286	0.601	-0.314	0.742		
TD	-0.028	-0.209	-0.127	0.363	0.507	0.417	0.029	0.401	0.029	0.806	
BI	-0.369	-0.416	-0.411	0.688	0.629	0.623	-0.251	0.602	-0.219	0.301	0.897

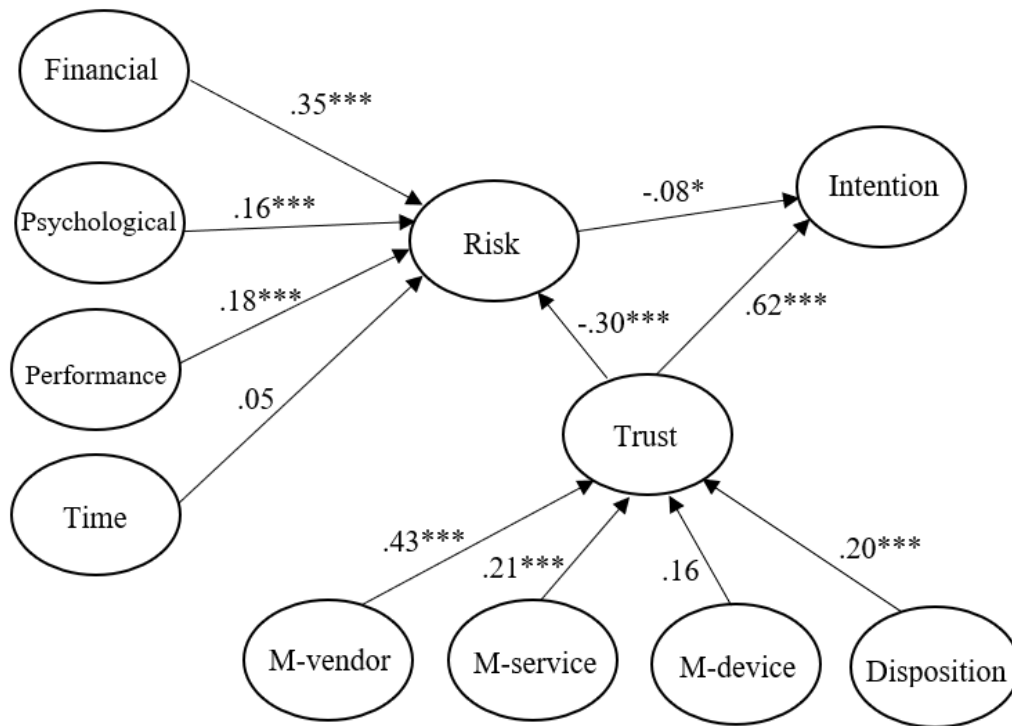
Note: PsR = Psychological risk; FR = Financial risk; TM = Time risk; PeR = Performance risk; PR = Perceived risk; BI = Behavioural intention; ST = M-service trust; VT = M-vendor trust; DT = M-device trust; TR = Trust; TD = Trusting disposition

5.2 Model Fit

Overall model fit was assessed in respect to five common absolute and incremental fit indices, being the normed chi-square (CMIN/DF), Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA). To achieve good model fit, it is imperative that the recommended thresholds are met; CMIN/DF = <3, GFI = >.85, AGFI = >.80, CFI = >.95, and RMSEA = <.06 (Hair et al., 2006; Hu and Bentler, 1998). Through examination into measurement model fit, standardised regression weights, modification indices, and standardised residual covariance estimates, and to avoid convergent and validity concerns, items PerR1, SR3, PsyR1, VT3 and DT2 were removed. The model subsequently achieved good model fit with the following indices: CMIN/DF = 1.917, GFI = .919, AGFI = .884, CFI = .972, and RMSEA = .046; thus, providing support for continuing analysis to the structural stage.

The model fit 2.145, GFI = .898, AGFI = .863, CFI = .961, and RMSEA = .051. Assessment of path coefficients reveal that financial risk ($\beta = .344, p = .000$), psychological risk ($\beta = .152, p = .018$), and performance risk ($\beta = .192, p = .023$) are all significant predictors of overall perceived risk, thus supporting hypotheses H2a, H2b and H2c, whereas time risk ($\beta = .046, p = .410$) is not, thus rejecting hypotheses H2d. Furthermore, m-vendor trust ($\beta = .430, p = .000$), m-service trust ($\beta = .212, p = .027$), and disposition to trust ($\beta = .202, p = .000$) are significant predictors of overall trust, therefore supporting hypotheses H3a, H3b and H3d. However, m-device trust ($\beta = .155, p = .121$) is insignificant in this instance, this rejecting H3c.

Overall trust ($\beta = .624, p = .000$) has significant relationships with behavioural intention, supporting hypotheses H1a. However, despite the significance of various risk antecedents, overall perceived risk ($\beta = -.088, p = .093$) is insignificant in this instance, rejecting H1b. The mediating relationship between trust and perceived risk is found to be significant ($\beta = -.303, p = .000$), thus supporting H1c. Figure 1 shows the conceptual model with the standardised results along the structural paths.



Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

Fig. 1 Structural model with standardised results

To examine the validity of the mediating relationship between trust and perceived risk (H1c), it is necessary to conduct a bootstrap analysis comparing the standardised direct effects both with and without the mediator, and the standardised indirect effect of trust on perceived risk. 3000 bootstrap samples with 95% bias-corrected confidence intervals were produced using AMOS. Both the standardised direct and indirect effect SRWs were noted and the p values obtained from the two-tailed significance of the bias-corrected percentile method. Results reveal trust to have a significant direct effect on intention without the mediating relationship with perceived risk ($\beta = .624, p = .001$). Significance is maintained when the mediating relationship between trust and risk is directly examined ($\beta = .835, p = .001$). However, trust

has an insignificant indirect effect on intention ($\beta = .027, p = .200$) and therefore has an overall direct effect on intention with no indirect effect.

Overall variance explained by this model has been established through examining the squared multiple correlations (R^2). The five independent variables on overall risk provide an R^2 value of .63, accounting for 63% of variance. Furthermore, the four independent variables on overall trust provide an R^2 value of .74, accounting for 74% of variance. Overall explained variance of the model equals 46%.

5.3 Moderating relationships

Although this theoretical model is designed to explore the validity of examining risk and trust and multi-faceted constructs to provide understanding into where consumers trust and are anxious at the m-purchasing stage of m-shopping, examination into gender and generation splits enhances the models' validity further. Three steps were taken to examine the moderating effects of gender and age; first, configural invariance was examined to establish overall good model fit for both gender ($\chi^2/df = 1.782$; CFI = .964; RMSEA = .043) and age ($\chi^2/df = 1.966$; CFI = .955; RMSEA = .047).

Second, metric invariance was performed comparing the standardised regression weights and p values for the two groups. For gender, financial risk, trusting disposition, m-vendor trust, and overall trust were found significant for both males and females, whereas time risk, m-service trust and m-device trust were insignificant for both groups. Accordingly, the metric stage of analysis reports discrepancies between groups concerning psychological risk, performance risk and overall risk, thus prompting for further analysis. The chi-squared difference test was performed using multi-group analysis in AMOS. Results confirm non-invariance for the relationships between psychological risk on overall risk and overall risk on intention (Table 6). Considering metric invariance results, the chi-squared difference test validates that psychological risk perceptions are higher for women ($\beta = .247, p = .004$) than men ($\beta = .065, p = .500$), which arguably significantly contributes to overall perceptions of risk. Furthermore, results certify that females are strongly influenced by their overall perceived risks ($\beta = -.247, p = .002$) whereas males are not ($\beta = .004, p = .954$). This is an interesting finding as despite oppositions regarding the individual constructs, both males and females show equally strong associations between trust and risk (males: $\beta = -.262, p = .000$; females: $\beta = -$

.308, $p = .000$. This verifies literary findings that trust negatively effects perceived risk in enhancing behavioural intention.

Table 6 Effects of Gender as a Moderator

Model no.	χ^2	df	χ^2/df	CFI	RMSEA	Nested model	$\Delta\chi^2$	Δdf	p	Inv
1	473.991	266	1.782	.964	.043	1				
2	476.682	277	1.721	.965	.041	1-2	2.691	11	.994	Y
3	482.470	280	1.723	.965	.041	2-3	5.788	3	.122	Y
4	500.831	288	1.739	.963	.042	3-4	18.361	8	.019	N
5a	483.504	281	1.721	.965	.041	3-5a	1.034	1	.309	Y
5b	473.991	266	1.747	.963	.042	3-5b	8.479	14	.863	Y
5c	486.705	281	1.732	.964	.041	3-5c	4.235	1	.040	N
5d	484.293	281	1.723	.964	.041	3-5d	1.823	1	.177	Y
5e	482.504	281	1.717	.965	.041	3-5e	0.034	1	.854	Y
5f	489.784	281	1.743	.964	.042	3-5f	7.314	1	.007	N
5g	485.148	281	1.727	.964	.041	3-5g	2.678	1	.102	Y
5h	482.570	281	1.171	.965	.041	3-5h	0.100	1	.752	N

Note: Model 1 = unconstrained; Model 2 = measurement weights constrained; Model 3 = measurement weights and structural residuals constrained; Model 4 = measurement weights, structural residuals and structural paths constrained; 5a = FR on PR; 5b = PerR on PR; 5c = PsyR on PR; 5d = VT on TR; 5e = TD on TR; 5f = PR on BI; 5g = TR on BI; 5h = TR on PR; Y = Yes; N = No.

For age, exploration into the metric invariance revealed overall trust and m-vendor trust to be significant across groups, whereas performance risk and time risk were found insignificant for younger and older consumers. Results also revealed discrepancies between groups for financial risk, psychological risk, trusting disposition, m-service trust, m-device trust, and overall risk. As with gender, a chi-squared difference test was performed to explore these relationships and established group discrepancies concerning m-service trust and m-device trust on overall trust, and overall trust on intention (Table 7). Referring to the metric invariance results, the chi-squared difference test verifies that m-service trust is higher for older consumers ($\beta = .435$, $p = .001$) than for younger consumers ($\beta = -.142$, $p = .405$), whereas m-device trust is higher for younger consumers ($\beta = .625$, $p = .006$) than older consumers ($\beta = -.034$, $p = .770$). Although not identified at the metric stage of analysis, the chi-squared difference test reveals that some discrepancies exist between age groups, whereby trust is slightly stronger for younger consumers than older consumers.

Table 7 Effects of Age as a Moderator

Model no.	χ^2	df	χ^2/df	CFI	RMSEA	Nested model	$\Delta\chi^2$	Δdf	<i>p</i>	<i>Inv</i>
1	715.514	364	1.966	.955	.047	1				
2	734.876	377	1.949	.954	.047	1-2	19.362	13	.112	Y
3	737.443	380	1.941	.954	.047	2-3	2.567	3	.463	Y
4	758.570	389	1.950	.952	.047	3-4	21.127	9	.012	N
5a	738.675	381	1.939	.954	.047	3-5a	1.232	1	.267	Y
5b	738.312	381	1.938	.954	.047	3-5b	0.869	1	.351	Y
5c	742.502	381	1.949	.953	.047	3-5c	5.059	1	.024	N
5d	742.249	381	1.948	.953	.047	3-5d	4.806	1	.028	N
5e	737.494	381	1.936	.954	.046	3-5e	0.051	1	.821	Y
5f	739.239	381	1.940	.954	.047	3-5f	1.796	1	.180	Y
5g	739.878	381	1.942	.954	.047	3-5g	2.435	1	.119	Y
5h	743.300	381	1.951	.953	.047	3-5h	5.857	1	.016	N
5i	737.451	381	1.936	.954	.046	3-5i	0.008	1	.929	Y

Note: Model 1 = unconstrained; Model 2 = measurement weights constrained; Model 3 = measurement weights and structural residuals constrained; Model 4 = measurement weights, structural residuals and structural paths constrained; 5a = FR on PR; 5b = PsyR on PR; 5c = ST on TR; 5d = DT on TR; 5e = VT on TR; 5f = TD on TR; 5g = PR on BI; 5h = TR on BI; 5i = TR on BI; Y = Yes; N = No.

6 Discussion and implications

This study has combined two theoretically grounded models depicting the antecedents of risk and trust and extended them to formulate a relationship between overall risk and trust on subsequent behavioural intention. Despite the longstanding nature of Jacoby and Kaplan's (1972) risk model and Lee and Turban's (2001) trust model, this study provides further support for their validity in the mobile environment in validation their predictive power of intention. These findings establish that, despite the heightened utilisation of mobile devices in users' everyday lives, consumers find using them for m-shopping purchases to be inherently risky, thus offering insight into why m-purchasing adoption rate is so low.

6.1 Insights on behavioural intention antecedents

Results reveal overall trust to be the most significant predictor of intention in holding the highest structural weight. This supports previous findings across online (e.g. Benamati et al., 2010; Chen & Dibb, 2010; Yang et al., 2015) and mobile (e.g. Alalwan et al., 2017; Gao et al., 2015; Lin et al., 2011; Luo et al., 2010) retailing contexts. Despite its overreaching positive effect on intention, this is primarily so for younger males. This finding is interesting as older

women are more highly influenced by perceptions surrounding m-vendor trust yet place low significance on overall trust. This supports previous findings by Lin et al. (2011) in finding younger Chinese consumers to be more influenced by trust perceptions towards initial m-commerce trust development, and Faqih (2016) in finding women to perceive lower levels of trust than men towards their e-purchasing adoption intention in Jordan. This finding also adds to previous understandings in indicating that older females' overall trust primarily derives from trust in the vendor, rather than other factors, whereas younger males are more influenced by their personal trusting dispositions rather than external factors.

Although three antecedents of risk, being financial, performance and psychological risks, significantly contribute to overall risk development, overall risk is found an insignificant predictor of m-shopping intention in this study. Although this is counter to some previous findings (e.g. Chang et al., 2016; Chen and Chang, 2011; Hanson, 2010; Hubert et al., 2017; Lian and Yen, 2014; Liébana-Cabanillas et al., 2014; Natarajan et al., 2017; Slade et al., 2015b; Yang et al., 2012; Zhang et al., 2012), it is in conjunction with others (e.g. Rouibah et al., 2016; Tan et al., 2014; Wong et al., 2012). Wong et al. (2012) examined Malaysian consumers' intention to adopt m-shopping and found perceived risk insignificant. Furthermore, Rouibah et al. (2016) found perceived risk an insignificant antecedent on consumers' adoption of online payments in Kuwait. Tan et al. (2014) also found perceived risk insignificant in the case of Malaysian consumers in m-payments and observed no moderating effect of gender. This study has validated examination of the moderating role of gender as results reveal females to be highly influenced by perceived risk whereas males are not. Therefore, although it has an overall insignificant effect on intention, retailers should remain mindful that developing more advanced information protection technologies and communicating its safety will reduce female consumers' anxiety and increase their subsequent adoption intention.

6.2 Insights on overall trust antecedents

Insight into the accumulative set of trust antecedents reveal an overall positive effect of various trusting factors on overall intention to shop online using mobile devices. M-vendor trust is the strongest antecedent of overall m-shopping trust and supports the vast amount of literature examining its relevance to overall risk and intention (e.g. Belanche et al., 2014; Hsu et al., 2014; Joubert and Van Belle, 2013; McCole et al., 2010; Pappas, 2016; Suki and Suki, 2017; Zhou, 2014). However, this result depicts consumers' trusting nature towards mobile retailers

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in a general sense, rather than actual organisational examples. For example, Groß (2016) examines m-vendor trust against two renowned online retailers, being Amazon and eBay, and find higher significance of such trust in respect to consumer-to-consumer situations than business-to-consumer. Having established a general depiction of the positive role of m-vendor trust in developing overall m-shopping intention, further research can examine consumer trust perceptions against specific retailers and m-shopping situations to obtain a greater understanding of its significance across retail contexts.

M-service trust is the second strongest antecedent of overall trust and is in-line with previous research findings (e.g. Belanche et al., 2014; Chen and Dibb, 2010; Hsu et al., 2014; Joubert and Van Belle, 2013; Lu et al., 2011; Martín et al., 2011; Suki and Suki, 2017; Yang, 2016; Zhou, 2014). Although Yeh and Li (2009) find that interactivity, being the instant connectivity and contextual offers, to not contribute to consumers' overall perception of trust, most literature examining structural and quality assurances regarding information, website, internet, system, e-service, and wireless services find them all to significantly influence overall trust and subsequent intention. Furthermore, this research reports older female consumers to be less influenced by their perceived trust in m-services than younger males. This finding is interesting as the omission of age and gender considerations in previous studies has given little guidance on moderating demographic effects on m-service trust. Therefore, this finding neither confirms nor disproves previous research but rather encourages further research endeavours.

Disposition trust is the third significant antecedent of overall trust. This finding supports most studies across research contexts (e.g. Chen and Barnes, 2007; Gefen, 2000; Gefen et al., 2003; Kim et al., 2008; Lee and Turban, 2001; Liao et al., 2011; Rouibah et al., 2016; Yaobin and Tao, 2005) in finding disposition trust to have a contributory effect on overall trust. Furthermore, results report both genders and generations to be positively influenced by their trusting dispositions. Although this is counter to the findings by Amin et al. (2015), who found males more susceptible to disposition trust than females, it supports previous literature confirming its ubiquity. Subsequently, these results indicate that a person's trusting nature is an overall essential factor in developing overall m-shopping trust perceptions. Although an individual's trusting disposition derives from deep-routed personal attributes, and is therefore uninfluenced by external stimuli, results do not suggest that consumer will only develop overall trust towards m-shopping if they have a trusting nature. Rather, results imply that consumers

may still develop overall trust in m-shopping without having trusting dispositions if other trust antecedents are present.

M-device trust has an overall insignificant effect on overall trust development towards m-shopping. Although this result is counter to several studies (e.g. Hsu et al., 2014; Lee and Turban, 2001; Yang, 2016; Zhou, 2013; 2014), it is in conjunction with other literature (e.g. Teo and Liu, 2007; Yeh & Li, 2009). In a qualitative study, Teo and Liu (2007) found trust in technology to have no significance on consumer trust towards e-government websites in Singapore primarily due to familiarity with the technology. Yeh and Li (2009) examined m-device trust in respect of customer perceptions surrounding its PU and PEOU in Taiwan; although ease of using mobile technology for m-commerce services was found a significant influencer of customer satisfaction towards the vendor, the usefulness of the mobile technology quality was insignificant. As mobile devices are universally mainstream, it is unsurprising that consumers place less significance on their trust towards devices as they have developed a habit in using them and therefore do not consciously consider their perceived trust towards them. Although its insignificance is supported for both males and females, multigroup analysis revealed discrepancies among generations. Results verify that older consumers are significantly influenced by their levels of trust in the m-device whereas younger consumers do not. This finding implies that older women may not be as technologically perceptive as younger men, thus requiring higher levels of trust when developing m-shopping intention. This supports findings by Lee et al. (2015) whereby younger users were considered to have higher levels of technological competence than older users. Although this research has contributed in finding trust in mobile devices essential in developing consumers' overall trust, further research can examine specific mobile device characteristics. Identifying m-device trust against mobile device attributes, rather than their technological abilities, will offer additional explanation into consumer m-device trust development.

Results subsequently conclude that consumers' m-shopping adoption intention is significantly enhanced through their overall trusting perceptions, particularly concerning trust in the m-vendor and their personal trusting dispositions. Marketing efforts should therefore concentrate on enhancing retailer reputations to encourage overall trust development. Furthermore, in being mindful of the target consumer, retailers should consider developing their m-services to be more user-friendly and aesthetically pleasing. Although trusting disposition and trust in mobile devices are outside of retailers' control, as all consumer

demographics have a trusting nature and only older consumers are significantly influenced by their trust in mobile devices, marketers can make efforts to subliminally market the use of mobile devices in everyday shopping situations.

6.3 Insights on overall risk antecedents

In examining four antecedents of risk, this study identifies differing strengths among relationships. This study supports findings by Jacoby and Kaplan (1972) in identifying financial risk as the most significant antecedent of overall risk. Despite this finding being in-line with most studies (e.g. Bianchi and Andrews, 2012; Featherman and Pavlou, 2003; Holmes et al., 2014; Lin et al., 2011; Slade et al., 2015; Wong et al., 2012; Zhang et al., 2012), it is counter to others (e.g. Dai and Palvia, 2009; Hubert et al., 2017; Tan et al., 2014). Despite financial risk being significant across genders, generational differences reveal older consumers as having lower levels of financial concerns. One explanation for this is that younger consumers generally have less disposable income than older consumers, therefore heightening concerns surrounding the slow speed of financial recovery upon financial loss. It is therefore paramount for retailers to enhance m-shopping security systems developments to ensure financial stability, particularly for younger consumers.

Despite performance risk being the most significant predictor of intention in the original study by Jacoby and Kaplan (1972), it is this second most significant in this study and supports findings from many previous works (e.g. Akturan and Tezcan, 2012; Bezes, 2016; Featherman and Pavlou, 2003; Hong, 2015; Hong and Cha, 2013; Stone and Grønhaug, 1993; Suki and Suki, 2017; Thakur and Srivastava, 2015). Hong (2015) found performance risk the sixth most significant predictor of Korean consumers' trust expectation surrounding online merchant selection. Bezes (2016) found performance risk the most significant antecedent of overall risk within online purchasing, which is expected as the risks of products malfunctioning or not being as expected is much higher in the online environment. Furthermore, Hubert et al. (2017) found performance risk the fifth of nine antecedents of UK consumers' m-shopping usage intention. Although initial multigroup results indicated discrepancies among consumer demographics, implying performance risk to be higher for males than females, results of further analysis reveal unanimity of its significance. Therefore, fears that using mobile devices to shop for products/services online will result in it not being as expected are significant deterrents of adoption intention. System developers could therefore advance m-shopping systems in

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improving the quality of product representations on mobile apps/websites to be as representative of the real product as possible.

Psychological risk is the third most significant antecedent of overall risk in this study, supporting vast amounts of existing literature (e.g. Bezes, 2016; Featherman and Pavlou, 2003; Hong and Cha, 2013; Jacoby and Kaplan, 1972; Lu et al., 2011; Yang, 2016). However, results also reveal demographic inconsistencies; Hong (2015) explains that consumers may experience lower levels of psychological risk when faced with external elements that are beyond consumer control. As results suggest, men are often able to rationalise psychological perception turmoil in displaying higher levels of reasoning when accepting situations outside of their own control (e.g. Chiu et al., 2005; Venkatesh et al., 2003; Venkatesh et al., 2012). Such psychological reasoning is presumed to develop with age, thus explaining the lower levels of psychological risk amongst the older generation. Therefore, retailers whose target demographics comprise of younger females must be mindful of higher levels of psychological concerns and should subsequently develop marketing schemes to reduce m-shopping anxieties and enhance adoption intention.

Although time risk has been found significant across research areas and contexts (e.g. Bezes, 2016; Featherman and Pavlou, 2003; Lu et al., 2011; Thakur and Srivastava, 2015; Yang et al., 2015), it is insignificant in this instance. Nevertheless, this finding is consistent with other literature; Akturan and Tezcan (2012) found time risk insignificant towards Turkish consumers' attitude towards m-banking services as they often find it a time saver rather than a time waster due to its mobility and capabilities allowing for quicker transaction handling. When examined against Malaysian consumers' attitudes towards online group buying, Suki and Suki (2017) found time risk insignificant due to consumers being afraid of receiving the product late, due to the lengthy transaction process. Due to the convenience of mobile devices and their capabilities of providing efficient m-shopping experiences, it is unsurprising that time risks do not contribute to UK consumers' overall risk perceptions.

Alongside overall trust having a significant effect on intention, findings also indicate its significant effect on overall risk. Although some literature has found this relationship insignificant (e.g. Luo et al., 2010), this finding is consistent with most literature across digital retail contexts (e.g. Gefen, 2000; Gefen et al., 2003; Lu et al., 2011); Hsu et al. (2013) found trust in the website, vendor, auction initiator and group members to significantly reduce Taiwanese consumers' risk perceptions towards their e-shopping intention. Furthermore, Groß

(2016) found trust to significantly reduce German consumers' risk perceptions towards their m-shopping continuance intention. Despite overall trust having low effect on older females' intention to use m-shopping, both generations and genders find trust necessary in lowering their risk perceptions. This finding is interesting as female consumers perceive lower levels of various risk antecedents but place high significance on overall risk, whereas male consumers place lower significance on overall risk and are yet heavily influenced by multiple dimensions of risk. Due to previous research having failed to identify such discrepancies, further validation of these findings is required.

6.4 Theoretical implications

As explained above, the proposed risk and trust model explains 40% of variance. Although the level of explained variance is relatively low, the isolation of antecedents on overall risk and trust reveals variance to be more in-line with previous studies; the independent variables on overall risk here provide 56% of variance, with the level of variance equalling a median of 74% in the study by Jacoby and Kaplan (1972), with the independent variables on overall trust providing 67% of variance, with Lee and Turban (2001) reporting their model as achieving 68.8% variance. The low level of overall explained variance was nevertheless expected as elements of risk and trust are not the conclusive influencers of intention, as evidenced by the wide breadth of technology acceptance literature. In having not been previously explored in this research context, this study contributes to existing research in finding both risk and trust perceptions to be highly prominent amongst UK consumers. Furthermore, results differ from those in previous studies in finding consumer to be more sensitive to financial, psychological and time risks than performance and social risks. Results also support findings relating to consumers' perceptions of trusting disposition alongside m-vendor, m-service and m-device trusts and contributes to contextual understanding.

As only two fundamental predictors of behavioural intention are utilised in this research, insight into e-commerce, m-commerce and m-shopping literature reveals several avenues for further research in extending this model to incorporate other behavioural predictors, such as those explored in the Technology Acceptance Model (TAM; Chung et al., 2010; Davis, 1989; Hubert et al., 2017), the Unified Theory of Acceptance and Use of Technology (UTAUT; Lian and Yen, 2014; Venkatesh et al., 2003), and the extended UTAUT model (UTAUT2; Marriott and Williams, 2016; Venkatesh et al., 2012).

Consistent with literature drawing on the significance of the moderating effects of age and gender within research models (e.g. Lian and Yen, 2014; Yang et al., 2015), results reveal multiple consumer demographic differences surrounding risk and trust perceptions. Results imply that female consumers are more mindful of m-shopping risks than male consumers. Furthermore, despite inconsistencies surrounding which types of trust influence intention, overall trust plays an equally important role with both gender's m-shopping intention. Generational differences are more prevalent than gender in finding younger consumers to be more highly influenced by perceived risks than older consumers. Furthermore, younger consumers are more mindful of m-shopping trust perceptions than older consumers. Therefore, results reveal younger females as being the most trust and risk-conscious demographic. This finding has contributed in identifying demographic discrepancies surrounding risk and trust perceptions surrounding m-shopping. Thus, these observations warrant further examination into m-shopping intention and promotes direction for future insight into behavioural differences among control groups.

6.5 Managerial Implications

“Service providers have invested great resources and effort on releasing mobile purchase services [and] they cannot recover costs and make a profit if users discontinue their usage and purchase [...] Thus, it is critical for mobile vendors to retain mobile shoppers and facilitate their continued purchase behaviour” (Gao et al., 2015, p.250).

Findings presented in this research supports enhancing practitioner understanding into how to monitor and subsequently combat m-shopping reluctance. Retail merchants have emphasised the importance of understanding consumer behaviour in marketing doing so is critical for the successful management and development of m-shopping in the retail industry (Hung et al., 2012). Therefore, encouraging consumers to engage in m-shopping activities, particularly at the m-purchasing stage, is a significant marketing strategy for digital retailers in attempting to increase market share through abetting spontaneous purchasing behaviour. Research examining the validity of today's digital retailer's utilisation of mobile marketing in respect of mobile-based communications and mobile-based shopping, reveal issues surrounding mobile reviews, contextual characteristics and perceived risks, alongside perceived costs and visual complexity (Hubert et al., 2017; Sohn et al., 2017). Consistent with existing literature, this study validates the positive effect of trust on behavioural intention in highlighting the necessity

for marketers to enhance trust perceptions through implementing developed m-shopping systems and the mobile reputation of the vendor to increase overall trust and subsequently reduce perceived risks. Furthermore, results reveal negative perceptions surrounding consumer's financial and psychological well-being alongside performance concerns, which prompts practitioner action. Consequently, practitioners may decide to either market m-shopping more effectively through advertising its safe, non-intrusive and simplistic nature, or to develop more rigorous payment security measures whilst improving its usability to be less time consuming upon switching from electronic to mobile.

7 Conclusions, limitations, and future studies

This study contributes to m-commerce literature in adding valuable empirical findings in the realm of consumer m-shopping intention through developing a conceptual model elaborating previously unidimensional constructs of risk and trust. Multi-faceted risk and trust has not been examined to this extent in previous m-shopping literature and findings contribute to understanding surrounding why UK consumers are reluctant to engage in m-shopping activities. Drawing on two research models separately examining risk and trust antecedents, the proposed conceptual model combining and adapting the two models was empirically examined to explain consumer adoption intention for m-shopping. Findings reveal financial, psychological and performance risks to be the most prominent concerns in the minds of consumers and that trust enhancements must become paramount concern for practitioners to reduce such risk perceptions and encourage m-shopping behaviour. Furthermore, results reveal discrepancies among control variables of age and gender imply the need for mobile retailers to enhance systems developments and shape marketing strategies according to risk and trust perceptions of their target demographic to help facilitate their m-shopping adoption intention.

While this study contributes to obtaining a better understanding into m-shopping intention, it is not without its limitations, those of which prompt for insightful avenues for further research. First, this research has incorporated risk and trust antecedents established in previous theoretical models and has presented further scopes for research in its adaptation across different research contexts alongside implementation of additional constructs. This research model can subsequently be extended to incorporate further antecedents of perceived risk, such as privacy and security concerns (e.g. Chung et al., 2016; Groß, 2016; Hubert et al.,

2017; Yang et al., 2015), personal characteristics, such as personal innovativeness (e.g. Slade et al., 2015), and mobile device and application/website characteristics (Chen and Dibb, 2010; Sohn et al., 2017), to name a few. Second, despite the proposed research model encompassing two theoretically grounded risk and trust models, its low explanation into variance implies further research to combine these research findings against other well-established technology acceptance models. Third, findings indicate merit in further studies taking a cross-cultural perspective to the application of the theorised model; for example, as social risks are considered immaterial in this instance, due to the independent nature of UK consumer behaviours, it will be interesting for further work to examine more inter-dependent cultures to establish the constructs' significance across contexts. This avenue for further insight can also be extended to encompass developed and undeveloped country comparisons. Finally, further research can extend findings to more contextual settings whereby specific products can be examined against performance risk, and m-vendor trust can be cross-analysed across types of organisations or, more specifically, particular vendors.

APPENDIX A. Measurement items and sources

Construct	Items	Sources
Intention	BI1: I intend to continue using my mobile device to shop online in the future BI2: I will always try to shop on my mobile device BI3: I plan to continue to use shop on my mobile device frequently	<i>Venkatesh, Thong & Xu, 2012</i>
Perceived risk	PR1: Using mobile devices to shop online exposes me to an overall risk PR2: I do not feel totally safe providing my personal private information when shopping online using my mobile device PR3: Overall, I find shopping online using my mobile device a danger to my sensitive information	<i>Featherman & Pavlou, 2003; Slade et al., 2015</i>
Financial risk	FR1: Using my mobile device to shop online involves more financial risk than on my computer FR2: Shopping on my mobile device increases the risk of financial fraud FR3: The chances of me losing money is high when using my mobile device to shop online	<i>Featherman & Pavlou, 2003; Oliveira et al., 2014; Martins et al., 2014</i>
Psychological risk	PsyR1: I often feel unnecessary tension when using my mobile device to shop online PsyR2: The thought of making online purchases on my mobile device makes me feel anxious PsyR3: Shopping online using my mobile device makes me feel uncomfortable	<i>Featherman & Pavlou, 2003; Nepomuceno et al., 2012</i>
Performance risk	PerR1: Products purchased on mobile devices have high risk of being defective or not as expected PerR2: The probability that something is wrong with the shopping process is high when shopping on my mobile device	<i>Featherman & Pavlou, 2003; Kim et al., 2008; Martins et al., 2014</i>

	PerR3: My mobile device may process online payments incorrectly	
Social risk	SR1: People who are important to me (e.g. family members, friends, colleagues) will think less of me if I do not use mobile devices to shop online SR2: People who influence my behaviour (e.g. teachers/lecturers, employers, celebrities) will think less of me if I do not use mobile devices to shop online SR3: If people in my social group are using my mobile device to shop online, I feel I should do the same to fit in	<i>Featherman & Pavlou, 2003; Venkatesh, Thong & Xu, 2012</i>
Time risk	TM1: It takes too much of my time to switch from shopping on my computer to using my mobile device TM2: Purchasing on my mobile device involves a time-consuming payment procedure TM3: Shopping on my mobile device could create more time pressures for me	<i>Featherman & Pavlou, 2003; Martins et al., 2014; Nepomuceno et al., 2014; Pappas, 2016</i>
Trust	TR1: I trust that my mobile device will be reliable when I shop online TR2: I trust the shopping systems available on mobile devices	<i>Gefen, 2000; Kim et al., 2008; Liao et al., 2011; Slade et al., 2015</i>
Disposition trust	TD1: In general, I consider myself a trusting person TD2: I generally trust other people, unless they give me reasons not to	<i>Gefen, 2000; Kim et al., 2008; Liao et al., 2011; Slade et al., 2015</i>
M-vendor trust	VT1: I am comfortable providing my bank details to retailers through my mobile device VT2: I generally trust mobile retailers, even if I haven't purchased from them before VT3: Mobile retailers are interested in my wellbeing as a consumer	<i>Amin et al., 2014; Belanche et al., 2014; Gefen, 2000; Kim et al., 2013; Nicolaou et al., 2013</i>
M-service trust	ST1: When shopping online, I feel that my mobile device is just as reliable as my computer ST2: My personal information on my mobile device is secure when using it to shop online ST3: The payment procedures involved in shopping on my mobile device are generally reliable	<i>Belanche et al., 2014; Hsu et al., 2014; Oliveira et al., 2014; Nicolaou et al., 2013; Pappas, 2016</i>
M-device trust	DT1: Mobile devices are safe to use when exchanging personal information DT2: I trust that my mobile device will always function adequately DT3: Mobile devices are trustworthy when using them to shop online	<i>Belanche et al., 2014; Liao et al., 2011; Oliveira et al., 2014</i>

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