International Journal of Engineering & Technology, 7 (4) (2018) 4954-4961

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET
doi: 10.14419/ijet.v7i4.20658
Research paper

Exploring facets of trust in older adult decisions to adopt mobile commerce

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Abstract

Mobile commerce currently suffers from low adoption rates even though mobile devices are seemingly everywhere. Retailers have not fully tapped the older adult consumer market, a market framed by two significant attributes. Firstly, older adults are currently the largest segment of the USA population and will be for many years. Secondly, older adults are already known to be a lucrative market for low debt their spending power make them a primary interest to online retailers. While research exists for mobile commerce technology, the older adult age group has not yet been a primary focus of exploration. This quantitative study specifically examined aspects of mobile device usage, privacy, and internet trust factors of mobile commerce adoption among older adults by adapting modern technology acceptance theory as the frame-work for the research. This study determined that older adults have similar levels of interest in mobile commerce technology as compared to younger consumers but approach new technology cautiously, with a deeper consideration of risks and consequences.

Keywords: *Mobile Commerce Adoption; Mobile Device Technology; Older Adult Trust; Smartphone Usability; Technology Acceptance Model*.

1. Introduction

Mobile commerce is considered online purchasing that leverages the ubiquitous existence of mobile computing devices. However, one problem faced by retailers is that the adoption rate of mobile commerce has been surprisingly low[1]. Age factors, usability, and the Internet or mobile computing trust factors have all played a role in the adoption rate of mobile commerce. A significant amount of prior research has sought to extend the Technology Acceptance Model [2] in the mobile computing realm. Such studies have investigated the usefulness and ease-of-use in mobile computing devices and applications, and mobile commerce has certainly been a part of that research [4] [6] [11] [17].

Researchers have highlighted attitude and skill level differences in how older and younger generations use Internet technology [19] [34]. Several researchers have also concluded that age is clearly a factor in online buying decisions [14] [35] [37]. For e-commerce and general internet usage, [14] indicated that older adults are slower to adopt these technologies and purchasing methods. However, the authors also pointed out that once older adults experienced successful purchases, their perceptions, and behaviors towards online shopping did not differ from younger adopters.

Among the various ages of consumers, older adults are already known to be a lucrative market for low debt, disposable income, and more leisure time than other generations [14] [15]. Older adults are also currently the largest segment of the population [12] [20] [29]. Their vast numbers and spending power make them a primary interest for online retailers who are investing in mobile commerce technology[1]. However, older adults have been weakly represented in many Internet technology studies [4] [14] [1] [23] [25] [37]. While research exists for mobile phone usage among older adults, mobile commerce is a developing technology and research concerning its adoption by older adults are scarce.

1.1. Theoretical background

An increased knowledge of mobile commerce adoption in older adults will contribute to a better comprehension of consumer needs and improved guidelines for mobile commerce technology designs [11]. Khalifa [1] indicated that mobile commerce is gaining rapid popularity globally as integration matures between the technology and Internet retail applications. The potential for retail channel sales that parallel the successes of e-commerce is widely present in mobile commerce considering the ubiquitous presence of a variety of mobile devices according to [1]. The mobile commerce retail channel was predicted to reach $119 billion in 2015 [1]. Rahman and Sloan[39] indicated a mobile commerce expansion to $1.3 trillion in 2015 and cited a prediction of $1.8 trillion in 2016. However, the authors still maintained that the mobile commerce market is below its potential. Researchers such as[19] have maintained that mobile retailers have still not fully accessed older adult consumers. Hernandez [14]discovered that older adults are already active participants in desktop e-commerce purchasing. However, the low adoption rate of mobile commerce has troubled retailers who still struggle to comprehend fully how the technology would best serve the consumer base [4] [1] [25]. Researchers [14][19] maintained that older adult consumers are largely a niche market in most retail channels that are not completely understood thus providing the impetus for this study which combined scholarly technology acceptance theory, mobile commerce technology, and the older adult consumer population.

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1.2. Statement of the problem

Khalifa [1] also pointed out the direct correlation between mobile commerce growth and the growing popularity of consumers with smart mobile devices such as smartphones and tablets. However, retailers have failed to tap the revenue potential of older adults [1], [20][29]. While older adults such as the Baby Boomers have had more exposure and access to mobile technology over the years than other generations, [20] indicated that it is still unclear whether older adults have a greater readiness to adopt innovative consumer technologies. As mobile commerce continues to gain popularity, retailers will continue to invest in this technology [1]. Future success in mobile commerce adoption would be further enhanced by understanding factors that are of primary concern to older adult consumers over 45 years of age who currently make up the largest and wealthiest segment of the population [11], [1][20][37].

1.3. Research question and hypothesis

The decision to adopt a given technology rests upon a collection of complex socioeconomic variables. In the retail channel, there are also behavioral attributes that affect the decision to make product purchases online as opposed to in-store visits by consumers. Gao [10] combined five independent constructs from widely recognized behavioral theories and technology acceptance models to create the Mobile Services Acceptance Model [MSAM]. While these same underlying theories where the basis of this study, the MSAM provided the core framework for this study. One overarching question utilized these independent constructs to guide this study: To what extent, if any, does trust influence mobile commerce adoption in older adults? In conjunction with the research question, this study addressed a hypothesis that corresponded to the research question variables:

Hypothesis 1

H01: There is no statistically significant positive correlation between trust and mobile commerce adoption in older adults.

HA1: There is a statistically significant positive correlation between trust and mobile commerce adoption in older adults.

1.4. Significance of the study

In the practitioners' world, the vast older adult population and the potential for an extensive pool of consumers is a primary interest for online retailers who are investing in mobile commerce technology. Mobile commerce is rapidly gaining popularity as a platform for untethered, wireless internet retail applications [1]. User adoption of mobile commerce in the conversion of potential mobile consumers to sales profits has become critically important. Retailer understanding of the factors that influence mobile commerce adoption plays a role in online retail sales successes [11]. Findings from this study will increase retailer knowledge of mobile commerce adoption in older adults that will enhance guidelines for mobile commerce technology designs that will better serve this vast population.

2. Literature review

Investigations in the realm of mobile commerce have prompted researchers to begin with a review of the underlying mobile technology, which is seemingly everywhere [4] [1]. Retailers who have invested in software development seek software that will run on all computing devices, but navigation and usability attributes have proven to be challenging for software development teams. While traditional e-commerce websites feature full-function shopping and payment capability, usability research has determined that optimized consumer shopping activities occur when a maximum of three clicks or screen touches complete functional tasks[9]. Salz[28] also indicated that consumers demand the mobile shopping experience to be consistent and instantaneous. The author pointed out that mobile consumers are unforgiving and abandon shopping activity to seek other retailers for similar products when application page loads exceed 10 seconds. Respondents in recent consumer surveys overwhelmingly indicated brand innovation after favorable mobile app shopping experiences. Inversely, more than half of survey responses pointed to irreparable brand loyalty damage after consumers experienced a poor mobile app shopping experience. It is noted, however, that trust factors in the migration of consumer purchasing to mobile commerce have also been mitigated by improvements in mobile security practices that include multiple factors in identity authentication techniques[5].

2.1. Low adoption rates in mobile commerce

At first glance, the popularity of mobile commerce among consumers appears to be advancing at a significant rate with increasing mobile app integration. Chang [5] highlighted an industry forecast of 2015 European and U.S. consumer purchasing from mobile devices at more than $65 billion. While this increasing rate in mobile commerce volume is high, Khalifa[1] maintained, however, that in comparison to the high penetration rate of mobile devices, the potential volume of consumer mobile commerce sales could be higher. The authors indicated that the adoption of mobile commerce purchasing among consumers is relatively low when compared to the ubiquitous presence of smart mobile devices that are well-equipped for mobile commerce transactions.

Conversely, [18] pointed out that the advent of wireless and mobile computing entirely changed the landscape of the digital world as seen by consumers. The technology laid the groundwork for unprecedented computing capabilities that included push delivery, location-based processing, and context-sensitive services. These capabilities have sparked entirely new service categories creating immense interest among industry players to bring the mobile capability to retail channels. The authors maintained that the mobile computing revolution has so profoundly changed the consumer device market that major manufacturers have rendered today's mobile device market a veritable battleground for personal communications and information technology devices.

More recently, information technology advancements targeted at improving mobile commerce sales via an analysis of consumer shopping behaviors have further exacerbated the relationship between retailers and consumers. Eastin [7] reflected upon the infusion of big data technology in retail channels. Consumers are acutely aware of retailer mining of personal data but vaguely understand how analysts use the data. The authors also indicated that retailers still largely fail when navigating the delicate balance between personalized messages that consumers welcome versus messages that dismay consumers. Eastin[7] maintained that consumer perception towards personalized advertising and data sharing has worsened over the past few years which has further lessened mobile commerce adoption in U.S. consumers. This literature review will provide an overview of several underlying theories that address various aspects of technology adoption including the widely-recognized Technology Acceptance Model [2] and the more recently focused Mobile Services Acceptance Model [10].

Secondly, mobile commerce is a relatively young technology and is still subject to experimentation among retailers [9][11]. Mobile commerce research has largely been a broad-brush investigation across the entire consumer baseline. To date, however, mobile commerce research has either vaguely segmented age groups or weakly represented older adults [4][14][1][25][37]. Lastly, research has been conducted for online purchasing consumer trust and concerns over system security [17] [25] [35]. However, little research exists that draws these three entities, mobile commerce purchasing, mobile device usage, and adoption by older adults into one single nexus of research. The focus of this study will investigate trust factors that influence mobile commerce in older adults. As such, this literature review will also examine attributes of the older adult population over 45 [31] and introduce the factors that may influence their intention to adopt and use mobile commerce technology.

2.2. Underlying theory

An examination of theory and factors that affect the adoption of a new information technology is critical to understanding the diffusion potential of new technologies such as mobile commerce [11]. Scientific research has spawned several models developed to examine an individual's attitude and intention towards technology adoption that was applied for this study. The Technology Acceptance Model [TAM], [2] concluded that only two determinants, ease-of-use, and usefulness, ultimately drove technology acceptance. Ease-of-use is an ongoing priority for system designers and implementers, however systems must first perform useful functions. The Theory of Planned Behavior [TPB][1] tied attitude and behavioral control perception to intended behavior. The theory is still widely applied and extended today towards modern technology adoption theory including mobile commerce [16] [26][32] [33] [35].

Originally conceived in 1962, the Diffusion of Innovations Theory [DIT] [27] was proposed to describe the reasoning and the diffusion rate for the cultural spread of new ideas and technology through four constructs, namely (a) the innovation itself, (b) a given period, (c) methods of communication such as media news and word-of-mouth, (d) and a system of social circles. The Unified Theory of Acceptance and Use of Technology [UTAUT] [32] was formulated to explain the usage intention and usage behavior of an information system. The theory is claimed to explain 70% variance on the intent to use technology and a 50% variance in actual technology usage [11][32]. Lastly, the Mobile Services Acceptance Model [MSAM] [10] sought to explain an individual's decision to adopt mobile services by leveraging the four theories described above. The MSAM was theorized to explain user perceptions and reactions to new mobile services technology and predict user adoption based on perceived advantages or shortcomings in usage. The model incorporated trust and the perception of risk in mobile services adoption. Personal information privacy and mobile security capability were determined to be important antecedents of mobile services trust.

2.3. Relevant research, gaps, and older adults

Several researchers have studied adoption rates in mobile commerce tying various attributes in technology and demographics to the research. In most cases, older adults have been lumped together with all adult ages in the sample groups. Typically, the percentage of older adults represented in the existing literature is small. As such, this study sought to focus specifically on mobile commerce adoption in older adults. In Chan [4], The authors incorporated age, gender, and levels of education demographics in the research. The research uncovered a weak correlational relationship between levels of education and mobile commerce usage. Of the 402 mobile commerce users, only 35 or 7.5% were indicated as being over 35 years of age. The research did not indicate the number of older adults in the study. The authors also listed the location of their research in Malaysia as a limitation suggesting that other countries be the focus of further exploration.

Khalifa [1] concentrated on the behavioral aspects and attitude towards mobile commerce adoption by extending the theory of planned behavior [TPB] [1]. This research specifically pointed to low mobile commerce adoption rates highlighted in the existing literature. While research cited [24] on a mobile commerce forecast of $119 billion by 2015, [1] maintained that the revenue potential for mobile commerce was much higher. The inclusion of older adults in the research conducted by [1] was substantially low. The reported listing of respondents over 45 year of age was less than 2% which established a significant gap in the representation of older adults.

Nassuora [25] conducted mobile commerce research within the country of Jordan. Of the several constructs in the research, those relevant included the TAM [2] perceived usefulness [PU] and perceived ease-of-use [PEOU] constructs. The study's most significant finding focused on the importance of consumer trust in mobile commerce adoption over other factors for Jordanians. The author indicated that consumer trust would play a substantial role in the mitigation of risk and uncertainty perceptions. The [25] study was limited only to the country of Jordan, Jordanian infrastructure, Jordanian culture, and Jordanian mobile services. Location gaps in the literature such as this provide an opportunity to conduct mobile commerce study in a much larger consumer population such as the United States. The author makes no mention of older adults, and there is no indication whether the study included adults over 45 years old at all. While the research examined the important issue of consumer trust, the age gap in participants provides the impetus for further study.

Hernandez [14] studied controlling aspects of age and gender on online shopping behavior. While the research was focused more broadly on online shopping. The authors sought to investigate consumers who already had experience with online shopping and found that as consumers gained experience with the technology, moderating attributes such as age and gender previously studied in the existing literature as initial adoption points diminished and became irrelevant. The authors also highlighted age attributes in who described older consumers as more reluctant to accept online shopping due to change resistance, lack of usage experience with electronic commerce technology, and a preference towards a traditional try-before-buy culture of in-store shopping that is more familiar to older generations. Older consumers were also generally less trusting of the Internet and perceived more privacy risk in e-commerce shopping.

For research concerning all age groups, gender moderation and the existence of a gender gap in mobile technology adoption has summarily evaporated. Chan [4] posited that mainstream mobile device usage among consumers has become so pervasive that mobile device functions have become a necessity of daily living. The authors found no discernible difference among gender groups regarding mobile technology adoption. Fagih [8] studied gender moderation on the TAM [2] constructs, namely perceived usefulness and perceived ease-of-use. The research utilized data collected from 14 Jordanian universities. Fagih [8] additionally concluded that gender has no moderating effect on mobile commerce adoption.

2.4. Age factor and older adult attributes

Volkom [34] pointed to PEW foundation data that revealed eventual technology adoption in older adults but at a slower rate than younger adults[38]. To that end, [20] also pointed out that there are differences in technology attitudes and adoption among older adult cohorts. The authors segregated the Baby Boomer generation from other older adults and concluded that Boomers are more apt to adopt podcasts and mobile devices than much older adults if the technology relates to improvements in healthcare services, cost savings, or personal health diagnoses. Recently, [21] verified that the age factor in mobile technology usage still strongly divides younger and older consumers regarding adoption. Older consumers focus more on mobile device usage such as navigation and usability, and were less confident about having to compare their actions with peers. Older adults sought to use mobile services in a more private sense for service usefulness rather than social value.

Research conducted by [13] determined that older adult's express frustration in society's overindulgent use of technology today and the migration away from face-to-face human contact. Older adults were less interested in technology advancements and reported vexation with the learning curves for innovations. Volkom [34] concurred with the findings in [13] stating that older participants specifically complained about technology usage for social communication and feared the advancing complexity as too difficult to fully understand. However, older adults favoured the idea that technology could be designed and tailored specifically for their usage and could assist with their transportation, wellbeing, and healthcare requirements. Despite frustrations, older adults were willing to put forth the effort to adopt a new technology if it assisted with the extension of their independence in society.

2.6. Trust factor background

In short, [10] defined the TU predictor as users' perceptions of the level of security and risk for transaction fraud or identity theft when using mobile computing services. After an occasional service interruption or security breach, trust in mobile computing can be easily lost for retailers after a lengthy and difficult effort to gain it initially from consumers. Privacy settings and application integrity were found to be important trust-gaining antecedents for transactions and payments on mobile commerce services. Consumer trust decisions were based on prior experience and peripheral knowledge of mobile service providers and applications.

With that said, trust has been a common topic of research concerning online environments. Tremendous Internet growth and development over the past decades have fueled a major revolution in online retail markets [11]. Behravan, Jamalzadeh, Jouya, and Markhali (2012) maintained that shopping experiences in online environments are directly related to the level of trust perceived by a given consumer. For retailers, the task of providing a safe and functional online shopping environment that is also welcoming and simple to use is paramount to earning consumer trust and keeping it to build long-term brand loyalty. The authors further indicated that Internet provider services, which provide consumer access to online retail environments, also play a significant role in building consumer trust on performance satisfaction, screen refresh speed, shopping cart security, and navigational simplicity.

Luo [23] also posited that repeated episodes of modern cybercrimes and computer hacking reported by the media have had a degrading effect on consumer trust perceptions and a bolstering of consumer concerns about computing risks, especially concerning mobile credit card payments. Progressive technology innovations in mobile devices that include fingerprint scanning and SIM card authentication have helped to mitigate consumer fear of compromised personal information privacy. However, Behravan et al. (2012) and [23] agree; one poor consumer shopping experience can ruin months or years of trust building after dozens of successful transactions.

Gao [10] also outlined experience in mobile device technology and expertise with vendor relationships as two independent antecedents of consumer trust in mobile applications. Well-reputed and widely accepted mobile applications carried a greatly enhanced level of usage trust by consumers. Major retail channels such as Walmart, Amazon, and Ebay also carried elevated levels of trust due to the favorable rate of consumer adoption by the vast populations of shoppers. The authors pointed to consumer trust building in [30] indicating that consumer trust in mobile technology was easier to gain than consumer trust in vendor relationships. Siau [30] determined that consumer trust in mobile commerce be a continuous building and maintenance process for mobile technology as well as vendor relationships. As such, the authors concluded that trust was a crucial factor in mobile application usage. Rahman and Sloan [39] pointed out that illiteracy further exacerbates low consumer trust. A certain level of technical understanding follows basic education that includes the ability to read screen data, instructions, and navigation in mobile commerce applications. The inability to understand transactions between consumers and retailers without third-party assistance further alienates illiterate consumers from mobile commerce retailers.

Very recent studies such as Alqatan, Noor, Man, and Mohemad [40]verified that mobile device trust factors continue to be a leading impediment to mobile commerce adoption. Despite tremendous growth in mobile device technology, the authors still considered mobile commerce to be an emerging technology. Vast functional improvements in mobile devices have paved a broad path for feature-rich mobile commerce services, however Alqatan et al. [40] observed that mobile commerce adoption has been quite sluggish with failing consumer trust factors as a prominent factor in low adoption levels. The authors concluded that the growing public perception of online risks in protecting personal information was challenging the propensity of consumers to grant trust to retailers. Consumer fear of personal financial data breaches and identity theft is at an all-time high. Retailers must come to terms with heightened consumer fears over mobile transaction security if mobile commerce is to diffuse completely into society [40]. To that end, the research conducted by [10] is still valid on trust factors having a direct effect on user adoption of mobile services. The trust construct is an important component of the MSAM.

3. Methodology

3.1. Sampling and instrumentation

The marginal understanding of older adults among online retailers provided an opportunity to examine this age group in a scholarly setting. The most recent decennial census data [31] measured adults aged 45-64 at 26.4% and adults aged 65 and older at 13% of the population. The total segment of older adults over 45 years old is therefore nearly 40% of the entire U.S. population. The sample frame for this study included individuals who were essentially 45 years of age or older and owned an intelligent mobile device, such as a smartphone or a tablet, which had mobile computing capability and Internet access beyond basic cellular, voice-only functions. Participants that qualified for inclusion were over 45 years of age, resided in the United States, and owned the described intelligent mobile devices. Participants also had to declare the use of mobile devices beyond just voice calls and were presented with an informed consent form, created by the researcher for this study, before qualifying to submit responses to the online survey. 412 responses were collected using SurveyMonkey, a third party online survey service. Once cleaned, 251 complete responses were processed providing data that were 100% compliant with the inclusion criteria and contained answers to all survey items with zero outliers and zero missing data.

Survey instrument items for this study included questions grouped into categories that mirrored the constructs developed for data collection. Each survey item employed an evenly-spaced, seven-point Likert scale response format ranging in levels of agreement from Strongly Agree to Strongly Disagree with one neutral data point at the center of each scale. The instrumentation was further embellished with common demographical survey questions including gender, residence location within of the United States, and household level of income. While the location and level of income were not directly related to the study design, these demographics highlighted the diversity of the sample as a strong representation of the national older adult population. All participants were required to agree to the informed consent before qualifying for inclusion in the study.

3.2. Measuring trust [TU]

Gao [11] adapted TU from several scholarly theories including the UTAUT [32]. The perception of trust in the MSAM [10] had several facets including perceived trust of online environments, trust in online payments, consumer trust and brand loyalty, performance satisfaction, and shopping cart security. For this study, participants were asked to provide their perceptions of trust in mobile commerce applications environments and usage. The trust group had a lead-in preamble, then listed the seven survey items below.

Table 1: Survey Items Related to Trust [TU]

Lead-in: I would use an app to purchase products or make payments on my mobile device…	
Data code	Measurement
TU 1	If I have a clear conception of the functionality of the app.
TU 2	If the mobile app provider is widely acknowledged (e.g., major retail brands).
TU 3	If the app protects the privacy of its users.
TU 4	If I can feel confident that I can keep the app under control.
TU 5	If I feel confident that the data returned by the app is reliable.

TU 6	If I believe it is risk-free to use the app.
TU 7	If it is safe to use the app.

Source: [11]

4. Data collection and analysis

4.1. Demographics

The 251 qualified responses yielded a response rate of 60.9% and was comprised of 49.0% male (N=123) and 51.0% female (N=128) respondents. The collected demographic data also included a wide diversity in household income levels and geographic location within the United States. The broad distribution of income levels among sample participants who own smart mobile devices attested to the fact that smart devices are seemingly everywhere. Despite the expense and recurring costs of mobile devices and data plans, mobile devices have become a core attribute of all walks of life, even at the lowest of income levels below 10K annually. Ages among participants were collectively 103 aged 45-54 (41%), 94 aged 55-64 (37.5%), 49 aged 65-74 (19.5%), and five over 75 years of age (2%). While the sample represented all age groups over 45, younger participants more strongly represented their age group in the total aggregate over older retirees.

4.2. Descriptive statistics

For SPSS analysis, new variables were defined, namely Trust and Intent representing the independent variable and the dependent outcome of the study. Among responses across the 7-point Likert-scale items in the survey instrument, average scores for the construct variables ranged from 5.078 to 5.206 with consistency in standard deviation indicating central tendency among the data. For N = 251 responses, all arithmetic means scored above the median score of 4.00 indicating that most respondents for nearly all survey questions predominantly agreed with the factors that promote mobile commerce adoption. As to assumptions leading to the appropriate use of parametric testing techniques, skewness measured for all survey items ranged from -1.507 to 1.845. All skewness measurements fell within an acceptable -2.00/+2.00 skewness threshold to accept a tenable assumption that the survey data collected is normally distributed. As such, parametric testing techniques were employed to measure the strength and direction of the variables. Lastly, a Cronbach's alpha (α) coefficient test was employed to measure internal consistency and reliability of the independent and dependent variables. Table 2 describes the details of the independent and dependent variables which all exceeded an acceptable threshold.

Table 2: Reliability Analysis of Scale Variables

Variable	Type	Items	α
Trust	IV	7	.958
Intent	DV	2	.958
All variables	---	2	.949

Note. IV = Independent Variable; DV = Dependent Variable; N = 251.

4.3. Correlation analysis

A key objective of this study was to measure the strength and direction of the linear relationships between the construct variables that comprise the influence on mobile commerce adoption as well as the inter-item relationships between the items that make up each construct variable. Figure 1 depicts the relationships between the independent variables and the dependent variable outcome.

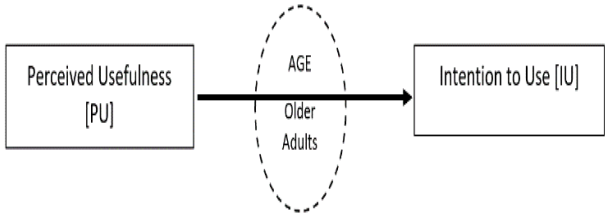


Fig. 1: Variable Relationships Diagram. Graphical Presentation of the Relationships of Each Independent Variable PU on the Dependent Variable IU as Moderated by Age.

The data provided below describes the results observed from Pearson's product-moment coefficient testing. The correlational analysis began with the overall Pearson's (r) test for the independent and dependent variables which displayed strong interrelationships but were within an acceptable threshold. Table 4 describes values of r for variable relationships.

Table 4: Correlational Matrix of Variables (R)

Variable	Type
Trust	IV
Intent	DV

Note. (a) IV = Independent Variable; DV = Dependent Variable;
(b) N = 251.
(b) Correlation is significant at the 0.01 level (2-tailed)

Inter-item correlation values of Pearson's r for items comprising the independent variable are displayed below and were within acceptable ranges. Table 5 describes inter-item relationships for TU items.

Table 5: Inter-Item Correlational Matrix of Items for Trust (R)

	TU1	TU2	TU3	TU4	TU5	TU6
TU2	.779					
TU3	.727	.739				
TU4	.739	.729	.809			
TU5	.728	.765	.836	.835		
TU6	.652	.658	.821	.809	.847	
TU7	.628	.687	.820	.794	.856	.910

Note. All correlations are significant at the 0.01 level (2-tailed)

4.4. Regression analysis and hypothesis testing

The plausible assumption of normality in the data provided an opportunity to test the hypotheses in the study with parametric techniques, specifically linear regression. For each of the construct variables, a linear regression was conducted, and the results reported at the individual item level and a summary level.

Hypothesis 1

H01: There is no statistically significant positive correlation between trust and mobile commerce adoption in older adults.

HA1: There is a statistically significant positive correlation between trust and mobile commerce adoption in older adults.

The data analysis planning employed a standard regression for the items associated with the independent variable trust [TU]. Table 6 describes the details surrounding the individual items that comprised TU.

Table 6: Regression Analysis for Trust Items [TU]

Model ß			SE	T	Sig.	Tol	VIF
1	(Con)	.677	.241	2.813	.005		
	TU1	.205	.063	3.235	.001	.309	3.233
	TU2	.118	.072	1.628	.105	.294	3.407
	TU3	.210	.084	2.487	.014	.214	4.673
	TU4	.270	.088	3.055	.003	.225	4.437
	TU5	.131	.099	1.321	.188	.164	6.105
	TU6	-.002	.098	-.019	.985	.140	7.141
	TU7	-.078	.104	-.753	.452	.138	7.240

Note. Dependent Variable: Intent

The analysis for TU items proved to be significant at the composite model level ($p < .05$). TU2, TU6, and TU7 were not significant independently. For multicollinearity concerns, items TU5, TU6, and TU7 fell below the acceptable collinearity tolerance threshold

of .200. The TU model at the summary level (F (7, 243) = 56.640, p < .05) was statistically significant in influencing the dependent variable and rejecting the null hypothesis. The value of R2 reflected a variance of 62.0% in the decision to adopt mobile commerce concerning the TU independent variable. The Durbin-Watson value for the TU model was an acceptable 2.051 within an acceptable range. Table 7 describes the summary results below.

Table 7: Regression Model Summary for Trust [TU]

(TU)	R^2	AdjR^2	F	df1	df2	Sig.	D-W
1	.620	.609	56.640	7	243	.000	2.051

Note. Dependent Variable: Intent
Predictors: TU1, TU2, TU3, TU4, TU5, TU6, TU7

5. Discussion of the results

5.1. Trust

Khalifa [1] also pointed out the direct correlation between mobile commerce growth and the growing popularity of consumers with smart mobile devices such as smartphones and tablets. However, retailers have failed to tap the revenue potential of older adults [20][29]. While older adults such as the Baby Boomers have had more exposure and access to mobile technology over the years than other generations, [20] indicated that it is still unclear whether older adults have a greater readiness to adopt innovative consumer technologies. As mobile commerce continues to gain popularity, retailers will continue to invest in this technology [1]. Future success in mobile commerce adoption would be further enhanced by understanding factors that are of primary concern to older adult consumers over 45 years of age who currently make up the largest and wealthiest segment of the population [11] [1][20] [37].

In the development of the MSAM, [10] considered the aspect of trust [TU] in mobile services as an influencing factor in the rate of adoption. Concerning these types of services, the authors considered trust to be the extent to which consumers of mobile services believed mobile applications to be free of any personal privacy or security threats. King and Jessen agreed with [10] on the point that trust in online services on the part of consumers is a precariously fickle and delicate commitment that requires a high level of successfully recurring product quality, service reliability, and customer satisfaction on the part of retailers. Given the extensive and growing choice of online vendors for given products or services, the slightest breach in security or consumer confidence can break the trust relationship with retailers after a time-consuming and arduous effort to gain it. The aspect of trust also covers several attributes under the one overarching concept including reliability in online mobile computing technology [4], risk factors in purchasing behaviours, monetary concerns and identity theft factors in online payment systems [6], established trust preconceptions based on prior purchasing experiences, and the transfer of online trust from older desktop e-commerce environments to trust in mobile scenarios over wireless or cellular networks.

Gao [10] maintained that reliable mobile commerce applications and integrity in data, security and privacy settings were also critical to building consumer trust in retailers. Corporate brands, reputations and governmental legislation could affect consumer loyalty to a given retail brand, purchasing behaviors, or the method of online payment transactions. In the development of the original survey instrument, [11] measured TU along three dimensions, namely (a) a user's trust in a given mobile service, (b) a user's trust with regard to the online service provider, and (c) a user's trust in their own proficiency with mobile computing systems.

The correlational analysis for the TU influencing factor displayed a strong positive relationship with the dependent outcome variable, the intent to use mobile commerce. The researcher expected this finding for older adults as the phenomenon of trust has consistently been found to be a strong influencing factor in several prior research studies of a similar nature [6][22]. From the regression analysis, TU displayed a strong, statistically significant influencing capability when regressed independently on the dependent outcome variable. TU accounted for 62.0% of the variance (F(7, 243) = 56.640, p < .05) on the decision to adopt mobile commerce in older adults. Inter-item relationships were not as strong as speculated and the data showed inconsistent relationships. Among statistical significance and multicollinearity concerns, TU6 and TU7 showed similar response profiles across the sample. Field testing of the survey instrument did not yield specific comments concerning TU6 and TU7. However, from the lead-in question: I would use an app to purchase products or make payments on my mobile device, the researcher noted that TU6: if I believe it is risk-free to use the app and TU7: if it is safe to use the app may have been construed by participants as similar inquiries despite the different context.

Some inter-item relationships were inverse in nature. While there were responses that favored item TU3: if the app protects the privacy of its users, more than 20% of respondents disagreed or were neutral. Hernandez [14] maintained that younger mobile computing users are more apt to superficially accept new Internet technologies, whereas older users proceed more cautiously and perceive greater risk and exposure, e.g. identity theft, towards unknown consequences involved with usage. Kumar [19] also suggested that retailers should cater to the economic value of mobile commerce to older consumers rather than any emotional or entertainment attributes. The authors maintained that older consumers favour utility over hedonic aspects of technology and might justify perceived levels of risk given economic rewards such as Internet-based discounts when choosing mobile commerce shopping methods over conventional methods.

Lastly, the trust factor has been highlighted as an influencing factor in the decision to adopt mobile commerce among older adults. Past research indicated that users become more disenchanted with new technology as they age. However, [19] contradicted this adage pointing out that older adults such as the Baby Boomer generation have witnessed and endured the advent of major technological advancements in their lifetimes including the NASA space program, color television, credit cards, GPS, and the digitalization of consumer electronics in appliances, healthcare devices, and automobiles. Wang [35] agreed with Kumar and Lim [19] on usefulness in the utility sense and added that older adults also adopt technology where there is a strong presence of support. Wang [35] observed that the largest avenue of technology support in older adults comes from their children. The prospect of strengthening family ties through a common adoption of a given technology such as social networking is important to older adults. The connection to technology through children helped to amplify the trust factor among older adults in using new technology [35]. To that end, the findings from this study indicated that trust is a strong influence in mobile commerce adoption, but retailers should consider the utility aspects of mobile commerce technology in addition to identity theft, fraud, data encryption, and other security risk components of online consumer systems.

5.2. Recommendations and future research

There are several aspects of mobile commerce adoption and mobile device usage among older adults that warrant recommendations for retailers attempting to improve sales in this lucrative consumer market. One particular area of growing concern among older adults involves the usability of consumer personal data that offsets perceived usefulness of mobile commerce. The researcher recommends that retailers invest in understanding older adult privacy concerns beyond the general level of public apprehension. Older consumers may consider retailers who negotiate multiple levels of personal data usage more innovative thus raising consumer confidence, the trust of the retailer, and the mobile environment. Older adults also conduct deeper research when shopping and desire highly detailed information before buying. Their requirements and research activities oppose the notion that the Internet is easy to use. The desire for the latest innovations declines with age, but technology anxiety increases as the years slowly degrade an individual's technical prowess. The researcher recommends that retailers might consider

multiple paths of usage complexity for older adult consumers as opposed to one generic application path intended for all consumers. Retailers will need to understand the differences in usage perception and consumer capabilities among older adults. Marketing organizations should directly address older adult consumer and help them change perceptions regarding cost and system complexity.

New application solutions for older adults should focus as much on tactile system design as on retail functionality. The researcher recommends that retailers concentrate specifically on perceived usefulness and ease-of-use. System solutions need to demonstrate effective, positive results for mobile commerce transactions, user interfaces, active feedback during usage, and integrated help systems. Support for mobile commerce systems must overcome obstacles commonly related to this age group including simplified suggestions for products, device and software installation services, live assistance during initial orientation, and real-time capability to walk older adult consumers through problem resolutions. In essence, older adults want to have confidence in using mobile commerce system and they long for solid trust their favourite retailers. Likewise, older adults desire mobile commerce systems that are easy to use and want to be certain that their investment in time and cost of mobile commerce service usage is valuable.

As to future research ideas, many retail organizations have attempted to exploit social networking to attract consumer buying by participating in the modern social networking scene. While the integration of social networking and mobile commerce will most likely continue to mature, the researcher considered the environment of this integration known as social commerce to be a line of demarcation for the scope of this study. Social commerce would be the next progressive stage of the electronic commerce legacy beyond mobile commerce, and an appropriate subject for future research that might build upon the findings of this study.

6. Conclusion

This study sought to explore how perceived usefulness and perceived ease-of-use influenced mobile commerce adoption in older adults to provide retailers with the principal targeting attributes to raise sales revenues in this lucrative consumer market. The research conducted built upon the theoretical constructs established in the MSAM [10] and the survey instrument created to measure mobile services adoption [11]. Existing literature on mobile commerce adoption has pooled older adults with other age groups and has poorly represented adults over 45 years old. This study sought to focus on older adults and concluded that two independent factors, PU and PEOU, were indeed influencers of mobile commerce adoption for older adults. Findings in prior research and from this study indicated however that the older adult agenda for mobile commerce adoption deviates significantly from those in younger generations.

The results and findings of this study indicated that the MSAM model developed by [10] applies to older adults in predicting adoption potential of mobile commerce technology. The researcher examined the stated hypotheses for this study with correlational analysis and linear regression models. Each case analysis rejected the null hypotheses. Parametric statistical analysis supported alternate hypotheses HA1 and HA2 showing a positive influence on the dependent outcome in each instance. The linear regressions for each independent variable displayed a positive influencing effect on the dependent outcome as did the overall aggregate regression of all independent variables regressed on the dependent variable yielding a 78.2% variance in the decision to adopt mobile commerce among older adults.

While older adults showed similar levels of interest in mobile commerce technology as compared to younger consumers, older adults still approach new technology more cautiously and with a deeper consideration of risks and consequences than their younger peers. Older adults substantially agreed that mobile commerce technology would benefit their lifestyles, and mobile commerce applications would be useful tools in conducting purchasing and payment transactions. However, there was no clear indication that older adults considered the operation of mobile commerce technology to be an easy task to learn. Prior research indicated that first impressions of a given new technology affected older adults concerning their personal initiatives in pursuing the mastery of that technology. Combining this phenomenon with the aging process weakened older consumer confidence in adopting new technology. In the case of mobile commerce, the findings from this study indicate that retailers should heed this consideration in making first impressions on older adult consumers with progressive mobile commerce technology when considering features and navigation attributes.

This study also found that, in comparison to younger generations, older adults are not as easily coaxed into new technology adoption based on current fads, trends, and societal pressure to modernize daily routines. Older adults typically consider how a new technology specifically affects their personal lifestyles and balance individual benefits against increased personal information privacy risks, identity theft, credit card theft, and any new additional costs associated with mobile commerce adoption. This is especially true of older adults who are already retired and live on fixed incomes. While this study found that older adults find satisfaction in operating mobile commerce technology, its entertainment value is shadowed by the utility and economic value. Older adults heavily rely upon the usefulness of mobile commerce technology more so than any enjoyment experienced by its use. As such, retailers should also heed these considerations as well if their intention is to raise sales revenues by targeting this lucrative consumer market.

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