Are there peas in a pod when considering mobile phone and mobile applications use:

A quantitative study

Abstract

Despite the acknowledgement of the significance of income, affordability and cultural factors in using mobile phones research, there are few studies on how these factors affect females' use of mobile technology. Hence, this paper aims to expand knowledge on female consumers' use of mobile phones and mobile applications in developing countries. It develops a model based on combining the extended unified theory of acceptance and use of technology and the cultural influence model. Multi-stage cluster sampling was used to distribute hard copy questionnaires in Jordanian, Iraqi and UAE households led to 629 replies from female consumers. The results indicated that although income is an important factor, cost is not the highest barrier for females. Culture, society, national IT development and inclusive policies play a key role. This study contributes to existing literature by proposing a new integrated model acknowledging the role of income for females' use of mobile phones.

Keywords: Gender; female consumers; mobile applications; Middle East; mobile phone use; culture

1. Introduction

The mobile phone is an innovation that has the capability to transform global lives, both organisationally and social. Companies use mobile phones to connect with their customers through various mobile applications (Shah, 2014; Beuermann et al., 2012; Murendo et al., 2018; Chaouali and Souiden, 2019; Högberg et al., 2019; de Luna et al., 2019). A region that has been impacted tremendously is the Middle Eastern region where m-commerce has grown

with indications that 40% of Arab smartphone users use mobile phones to purchase products from retailers (Adeo Group, 2019). Such growth figures indicate that mobile Internet and mobile phones use can achieve many benefits for both consumers and retailers. Despite acknowledgement of the significant role played by mobile phones in assisting organisations with their communication with clientele and market their products, there is a gender retail gap due to female consumers still not using them as much as their counterparts (Granryd, 2018). Gender inequality in accessing mobile technologies is aggravating the inequalities of female consumers (Burjorjee and Bin-Humam, 2018; GSMA, 2018). This is especially true in developing countries (GSMA, 2018). Females are 10 percent less likely than males to own a mobile phone and 23 percent less likely to use mobile internet (Prause, 2019; GSMA, 2019). Hence, 313 million fewer women use mobile internet services – mainly in regions of the world where the main method of accessing the internet is with a mobile device (Prause, 2019). Closing the mobile gender gap could inject an additional $700 billion in GDP growth into these countries over a five-year period (Prause, 2019). In addition, there are other areas affected by gender and income disparities as they also expand to data-based analysis (big data analysis, mobile positioning and mobile social media data), leading data to be biased across different social groups.

In the Middle East, 48% of all females (84 million females) are not connected to the internet through a mobile phone (GSMA, 2015). This may be because of the high charges of mobile internet from the female perspective. The gender gap applies to owning a mobile phone and using mobile internet. However, this gap is wider for mobile internet use than it is for mobile ownership (Burjorjee and Bin-Humam, 2018; GSMA, 2018). Gender differences in the Middle East are due to cultural issues (Ameen et al., 2018). For such reasons, understanding females

use of mobile phone use is imperative to bridge the gender gap in the Middle East due to the cultural restrictions' females in these countries face.

Many recent research studies of the gender technology gap highlight cost as a significant factor restricting women from mobile phone ownership and using mobile internet (Burjorjee and Bin-Humam, 2018; GSMA, 2018). "Cost and affordability of mobile money is a top priority for poor and low-income females when assessing mobile money services" (Burjorjee and Bin-Humam, 2018; p. 5). Thus, the gender gap for owning a mobile device and using mobile internet is a consequence of economic capacity (Granryd, 2018; GSMA, 2018). Closing the gender gap is vital to allow females to access increasingly digitised societies and economies (GSMA, 2018; Duvendack and Palmer-Jones, 2017; Garikipati et al., 2017). Non-government organisations with the power to enforce policies socially and politically such as, the United Nations' has established one of the sustainable development goals for 2030 as to empower women through the use of technology (United Nations, 2018a; United Nations, 2018b). Previous studies have also proved that mobile coverage and use reduces poverty (Beuermann et al., 2012). Economically, eliminating the mobile gender gap will lead to commercial benefits for retailers, the mobile industry at a national level and organisations using mobile applications for marketing their products and sustain links with their clientele (McLean et al., 2018; Huang, Korfiatis, and Chang, 2018; Choudrie et al., 2018).

From an academic perspective, despite acknowledgement of the significant role of income (Gelvanovska et al., 2014), there is a gap in research on developing countries when analysing this factor as a moderating factor that affects female use of mobile phones and mobile applications. Previous research studied gender, age or experience as moderating factors which were present in past adoption and use studies using classic theories like, the unified theory of

acceptance and use of technology (UTAUT) (Venkatesh et al., 2003). Furthermore, existing literature lacks studies that test the moderating effects of income on female use of mobiles in different countries, particularly in the Middle East. **A**dditionally, there are minimal studies analysing the effects of cultural factors that are specific to mobile phones, the Middle East and Arab females use of mobile phones and mobile applications and income's role as a moderator when using mobile phones. This led to the motivation of forming the aim of this study: to expand knowledge on female consumers' use of mobile phones and mobile applications in developing countries. The developing countries being considered are Iraq, Jordan and the United Arab Emirates (UAE), which were selected for four reasons. First, these countries are ranked differently in their economic ranking (World Bank, 2017). Second, these countries have a large gender gap in general (UNDP [United Nations Development Programme], 2015). The findings will help to bridge the gender gap in each of these countries. Third, the three countries are in the Middle East region, which is ranked third for the gender gap in owning a mobile and using mobile internet (GSMA, 2018; GSMA, 2019). The gender gap in mobile internet use in the Middle East is 20% and the proportion of women who use mobile Internet in this region is 48% (GSMA, 2019). Fourth, Iraq, Jordan and the UAE score differently in terms of country scores by mobile internet connectivity. Iraq is classified as 'emerging' in terms of mobile internet connectivity as it scores 46.46, while Jordan is classified as 'transitioner' as it scores 60.84 and the UAE is classified as 'advanced' as it scores 74.27 (GSMA, 2018b). Hence, the inclusion of these three countries to test our proposed model provides a better understanding of how the model fits in three countries which are ranked differently in mobile Internet connectivity in the Middle East region. The inclusion of three countries with different economic development levels helps to reveal the effects of income on females' use of

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smartphone technology. It also helps to understand the similarities and differences between females' preferences in countries with different characteristics.

By fulfilling this aim, the research provides theoretical contributions and practical implications for the industry. In terms of academic theory, the research proposes a new conceptual framework that integrates the classic theories of the UTAUT2 (Venkatesh et al., 2012) and a cultural influence model (Straub et al., 2001) and it proposes more precise hypotheses based on theory. This framework focuses on the use of mobile phones and different mobile applications. Furthermore, it bridges a gap in the literature in investigating how income affects Arab female consumers' use of mobile phones and mobile applications as a moderating factor in different countries. Furthermore, this study hypothesises new relationships between the predictors (including culture and national information technology (IT) development and policies) of intention as well as use of mobile phones and mobile applications. Finally, this study examines the effects of income level on females' use of mobile phones and mobile applications in three different Arab countries: Iraq, Jordan and the UAE. Therefore, for industry, this study identifies the pertinent role of gender and income, so when considering marketing strategies, providers can also consider female consumers further. For policymakers, this study offers support and reference to the role of female consumers, which could be emphasised in future policies and strategies.

2. Background

2.1 Mobile phones usage in the Middle East

Previous studies examined the use of mobile phones in the Middle East region in different areas for example: mobile payment, mobile health, mobile banking and mobile government

(Ramadan and Aita, 2018; Mutahar et al., 2018; Alasmari and Zhang, 2019; Merhi et al., 2019; Sharma et al., 2018). In addition, previous studies showed that the use mobile technology can bring various benefits at the individual, group and society levels as well as businesses in this region by increasing the level of connectivity (Ameen et al., 2018; Tarhini et al., 2019). Table 1 shows examples of some of the most recent studies in the area of mobile technology usage in the Middle East.

Table 1

Examples of most recent studies in the area of mobile technology usage

Author(s)	Context	Method	Focus on women and their income level
Ramadan and Aita (2018)	Mobile payment	A questionnaire was distributed to consumers in different Arab countries	X
Alhassan et al. (2018)	Smartphone addition and depression	A questionnaire was distributed to Arab consumers on social media	X
Jose (2018)	Female emigrant entrepreneurs' digital promotion strategies	A questionnaire was distributed to female emigrant entrepreneurs in UAE.	X
Alzubi and Farea (2018)	Mobile marketing	A questionnaire was distributed to Jordanian citizens	X
Alkhaldi (2018)	Use of m-government services	A questionnaire was distributed to participants in Saudi Arabia	X
Mutahar et al. (2018)	Mobile banking	The research was conceptual	X
Alasmari and Zhang (2019)	Mobile learning	A questionnaire was distributed to students in Saudi Arabia and a number of interviews were conducted	X
Baytiyeh (2018)	Students' use of WhatsApp	Interviews were conducted with college students	X
Sharma et al. (2018)	Mobile applications in	A questionnaire was distributed to citizens in Oman	X

	government services		
Tarhini et al. (2019)	Mobile commerce	A questionnaire was distributed to citizens in Oman	X
Merhi et al. (2019)	Mobile banking	A questionnaire was distributed to participants in the United Kingdom and Lebanon	X
Abedalqader et al. (2019)	Smartphones and sleep quality	A questionnaire was distributed to participants in UAE	X
Elareshi and Ziani (2019)	Mobile applications (WhatsApp)	A questionnaire was distributed to women in Bahrain	X
Landes and Freeman (2019)	Students' use of mobile phones	A questionnaire was distributed to students in UAE	X

The analysis of the recent studies identified in Table 1 shows that there is a gap in research focusing on female's use of mobile phones and different mobile applications and the effect of their income level on this use, despite the significance of this area. Hence, this research aims to bridge this gap in research.

2.2 Mobile phones, mobile internet and the gender gap

The Middle East region is ranked third in the world when considering the gender gap and mobile possession (9%) and use of the mobile internet (21%) (GSMA, 2018a). Reasons for this gap include, the lack of literacy, relevance, digital skills as well as cultural, demographic, safety and security factors, while affordability is ranked the highest barrier (GSMA, 2019). Income is viewed as a significant predictor of the width of the gender gap in developing countries (GSMA, 2019). In the majority of Middle Eastern countries, females have fewer rights than males in obtaining jobs, job retention and social life (Ameen and Willis, 2018b). Females also endure many economic restrictions (Ameen and Willis, 2018b). For such reasons, the average participation rate for Middle Eastern females in the labour market is 19%, which is the lowest

in the world (World Bank, 2017). Previous reports have shown that even education may not enable Arab females to access the job market (World Bank, 2018), which has an impact on the level of income that females in these countries are able to earn.

Table 2 provides a background on each of the three countries included in this research. As a country that has been through war and unstable political and economic conditions and classified as a middle-income country, the gender gap in Iraq is one of the widest in the world, as it is ranked 123rd in the gender inequality index rankings (UNDP, 2015) and the labour force participation rate is 19% with a low salary level (World Bank, 2017). Due to the political turmoil and subsequent challenges, the country has not reached an advanced level of mobile applications use such as, mobile social media, mobile commerce and mobile banking for shopping purposes (GSMA, 2016). The use of smartphones is growing as 40% of mobile users use smartphones in the Middle East (GSMA, 2017a). Within Iraqi females, affordability and income were highlighted as major hurdles that hinder a faster adoption of smartphones (GSMA, 2017a).

Table 2
Background information on Iraq, Jordan and the UAE

	Iraq	Jordan	UAE
Gross National Income (GNI) per capita	$17,210	8,980	72,830
Mobile connectivity index	47.5 Emerging	59.1 Transitioner	72.3 Fast transitioner
Gender inequality index ranking	123	111	46
Global gender ranking	*---	135	120
Gross Domestic Product (GDP) per capita	$4,609.60	$4,087.94	$37,622.21
Female labour force participation rate	19%	14%	41%

Mobile penetration rate	98%	170%	210%
Smartphone adoption rate (out of all mobile users)	40%	83%	99%

Sources: World Bank (2018); GSMA, (2016); UNDP (2015); World Economic Forum (2017); World Bank (2017); GSMA (2017); Middle East Media (2017)

*Data on Iraq was not available

Similar to Iraq, Jordan ranks high in the gender inequality index (111th) (UNDP, 2015) and women's labour force participation is 14% with a low salary level compared to males (World Bank, 2017). The country ranks low in GNI and GDP per capita (World Bank, 2017). 83% of mobile users use smartphones and women are restricted due to cultural barriers (GSMA, 2017a; USAID, 2019). The UAE is an upper-middle income country that ranks high in both GDP and GNI per capita (World Bank, 2017). The country is considered advanced in Arab countries context due to economic development, female labour force participation and smartphone penetration rate (World Bank, 2017; UNDP, 2015; GSMA, 2017a). In addition, the UAE is ranked the best in the Arab region in wage equality between males and females (Gulf Business, 2018).

2.3 The role of income in Arab females' mobile phones usage

When comparing the use of technology, the GDP per person is an important factor (Alrawabdeh et al., 2012; Ameen, 2017). However, research has shown that developing countries may still have a high rate of technology usage (Kalba, 2008). In such cases, GDP may not be regarded as the sole predictor of technology adoption (Kalba, 2008).

When considering the gender technology gap and adoption, research has found that there are several reasons (Ameen and Willis, 2016). One major reason for this difference could be due to developed countries having many females being in employment, with a significantly lower number of females working in the Middle East (World Bank, 2017). Thus, the internet service

provisions offered to them needs to be different from the services provided to females in developed countries. Female economic equality remains a major issue for Arab women (Abirafeh, 2017). This lack of female economic equality in the region is linked to cultural barriers and family laws (Abirafeh, 2017). Marciniak and Gad Mohsen (2014) explained that for instance, there is a unique and pronounced nature of Arab cultural values when considering family and social issues due to restrictions affecting female consumption of various mobile products (including mobile phone devices). This also showed that due to lower female employment figures, income is another factor that is highlighted as an important demographic factor when determining mobile phone ownership and mobile Internet use. What was also clear is that there are few research studies investigating and understanding how income affects female consumers mobile phones and mobile applications use.

In many Middle Eastern countries, females have less rights than males in job retention and social activities (Ameen and Willis, 2018b). In several Arab countries, females suffer from many economic restrictions (Ameen and Willis 2016; Momani, 2016; Ameen and Willis, 2018b). The average participation rate in the labour market for women in Arab countries is 19%, the least worldwide (World Bank, 2017b). Previous research has shown that even education may not enable Arab females to access the job market (World Bank, 2016). This has an impact on the level of income that females in these countries are able to earn. Females in the region have significantly less chance of obtaining a job, so females without jobs are using mobile devices for social purposes only (Lobo and Elauf-Calderwood, 2012).

The analysis of the studies on the role of income in mobile adoption (Alalwan et al., 2015; Mutahar et al., 2018; Chawla and Joshi, 2017; Alalwan et al., 2018; Abayomi et al., 2019) reveals that there are three main theoretical gaps. First, little research has analysed the influence

of income on technology adoption. Second, among these studies, the majority focused on technology systems used in banking and financial transactions, rather than the general use of mobile technologies. Third, none of these studies have studied the influence of income on females' use of mobile phones and mobile applications in a cross-national context of Arab countries.

3. Conceptual model

3.1 Theoretical foundation

Previous research focused on technology adoption as many theories exist in this area; the UTAUT (Venkatesh et al., 2003) and the UTAUT2 (Venkatesh et al., 2012) are among the most well-known theories in this area (Dwivedi et al., 2017; Abbas et al., 2018; Aliaño et al., 2019). The theory was based on combining and contrasting different factors in eight of the most well-known technology acceptance theories (Venkatseh et al., 2003) used to understand human interaction with technology and what leads them to adopt a certain technology including: theory of reasoned action (Ajzen and Fishbein, 1980), social cognitive theory (Bandura, 1986), technology acceptance model (Davis, 1989), motivational model (Davis et al., 1992), theory of planned behaviour (Ajzen, 1991), model of PC utilisation (Thompson et al., 1994), combined technology acceptance model and theory of planned behaviour (Taylor and Todd, 1995) and diffusion of innovation theory (Rogers, 2003). The theory is well-cited in the existing literature on technology adoption (e.g Bawack and Kamdjoug, 2018; Mansoori et al., 2018; Ameen and Willis, 2018a; Seethamraju et al., 2018; Khechine and Lakhal, 2018; Ameen and Willis, 2018b; Jewer, 2018; Thongsri et al., 2018; Raza et al., 2019; Cao and Niu, 2019; Yang et al., 2019). The two models tested the moderating effects of demographic factors. The effects of these moderating factors have been studied in recent research that tested or

extended the UTAUT (Venkatesh et al., 2003) and the UTAUT2 (Venkatesh et al., 2012) models (Alotaibi et al., 2017; Warsame and Ireri, 2018; Ameen and Willis, 2018a; Garone et al., 2019; Raza et al., 2019; Lin and Lai, 2019).

Although the UTAUT and UTAUT2 have been studied in various technological systems in the Middle East (e.g. Baabdullah et al., 2015; Tarhini et al., 2016; Alalwan et al., 2017; Alalawan et al., 2018; Cao and Niu, 2019), only one study (Al-Qeisi et al., 2009) investigated the effect of income within the context of the adoption of online banking. Thus, this research seeks to bridge these gaps by proposing a model integrating the UTAUT2 (Venkatesh et al., 2012) and the cultural influence model (Straub et al., 2001) as well as using income as a moderating factor. These two models were selected for three main reasons. First, the UTAUT2 is a unified model based on combining the main factors found in many previous technology adoption theories (Venkatesh et al., 2012). Hence, it includes some of the main factors which were found significant for technology use in the existing literature (Ameen and Willis, 2018b). Second, the cultural influence model includes cultural and national IT development and policies factors which are specific to smartphones and the Middle East (Ameen et al., 2018). Furthermore, we hypothesise three new relationships in the model: the relationships between national IT development and facilitating conditions; between effort expectancy and perceived relative advantage; and between culture-specific beliefs and values and actual use. Third, the inclusion of income as a moderating factor provides a more indepth understanding of how it affects mobile phones usage.

3.2 *Hypothesis development*

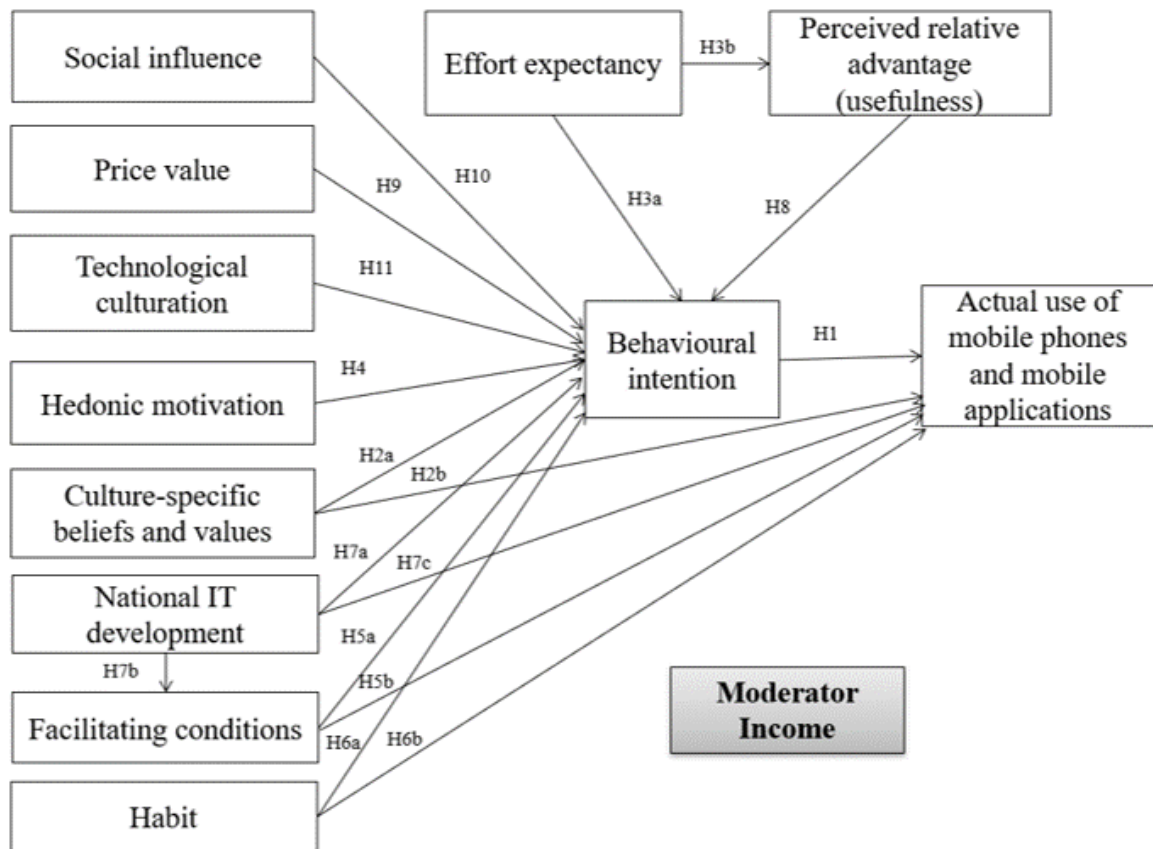The hypotheses developed in this study are explained in this section. Figure 1 shows the model proposed in this study.

Figure 1

Proposed model

3.2.1 Behavioural intention (BI)

Based on Ajzen (1991), behavioural intention can be defined as the intention to continue using mobile phones and mobile applications or to use them in the future. Previous studies have identified behavioural intention as a significant factor affecting actual use of different technological systems (Bawack and Kamdjoug, 2018; Mansoori et al., 2018; Venkatesh et al., 2012; Ameen and Willis, 2018a). Females have a strong intention towards the use of various technologies, although this intention is stronger among males (Liu, 2016; Alotaibi et al., 2017). From the perspective of the effect of females' income, females on a high level of income have

a higher intention to use of mobile phones and mobile applications, as they have a higher level of affordability (Torres et al., 2017; GSMA, 2018a). Hence:

H1. Income moderates the effect of behavioural intention on the use of mobile phones and mobile applications so that its influence is stronger among females on a higher income.

3.2.2 Culture-specific beliefs and values (CSBV)

Culture-specific beliefs and values refer to cultural beliefs and values can have an influence on information systems use (Ameen et al., 2018). It was found to be significant in research on technology transfer (Straub et al., 2001; Leung et al., 2002; Abu Nadi, 2012; Ameen and Willis, 2018b). Within the context of female usage of mobile phones, culture could affect female preference for meetings via mobile phones versus face-to-face meetings' (or vice versa). Previous studies have shown a shift in Arab culture towards a preference for meetings via mobile phones (ALsswey et al., 2018; Ameen and Willis, 2018a). Hence, this factor can affect both intention and usage of smartphones and mobile applications. Due to cultural restrictions, females in these countries, specifically the three countries studied, may prefer meetings via mobile phones over face-to-face meetings (Ibahrine, 2008; Jose, 2018). This is due to cultural and family restrictions associated with the face-to-face meeting for females in these countries (Ameen and Willis, 2016). Since females on higher incomes have more access to mobile phones and mobile applications (GSMA, 2015; Sekabira and Qaim, 2017; GSMA, 2018a), they may have a stronger preference for meetings that take place using mobile applications. Hence, we hypothesise:

H2a. Income moderates the effect of culture-specific beliefs and values (mobile-mediated meetings) on behavioural intention towards mobile phones and mobile applications so that its influence is stronger among females on a higher income.

H2b. Income moderates the effect of culture-specific beliefs and values (mobile-mediated meetings) on the use of mobile phones and mobile applications so that its influence is stronger among females on a higher income.

3.2.3 Effort expectancy (EE)

Effort expectancy is the ease of individuals' use of technology (Zhou and Wang, 2010; Venkatesh et al., 2012; Magsamen-Conrad et al., 2015). It refers to how easy it is to use both a specific mobile phone device and mobile applications in general. Middle Eastern females have fewer opportunities to use a mobile phone (Ameen and Willis, 2018b). Hence, effort expectancy may predict behavioural intention. Furthermore, previous research revealed that effort expectancy can predict performance expectancy (Sung et al., 2015). When the system is easy to use, individuals are more able to realise its benefits (Sung et al., 2015). It can also be argued that the lower a female's level of income is, the more significant the effect of effort expectancy is. This is due to lower income females having less access to mobile phones (Sekabira and Qaim, 2017), especially in the Middle East (GSMA, 2018a). A low level of access leads to a lower level of experience in using technology; in turn, this has an important impact on a user distinguishes a system to be easy or difficult to use (Venkatesh et al., 2012). In contrast, higher income females may have a higher level of experience, which makes effort expectancy less significant for them. This may contradict the influence of income as a moderator of the effect of effort expectancy on relative advantage. Higher income females may not find effort expectancy to be a problem, because of the high experience level they obtained

when using mobile phones and mobile applications. Thus, they may be more aware of the advantages of these technologies. Hence, we hypothesise:

H3a. Income moderates the effect of effort expectancy on behavioural intention so that its influence is stronger among females on a lower level of income.

H3b. Income moderates the effect of effort expectancy on perceived relative advantage so that its influence is stronger among females on a higher level of income.

3.2.4 Hedonic motivation (HM)

Hedonic motivation refers to the fun consumers have when using different technologies and it was found significant in existing research (Venkatesh et al., 2012; Ramírez-Correa et al., 2019; Kim and Hall, 2019; Tamilmani et al., 2019). This factor was found significant in Asian countries (Guo, 2014; Sharifi fard et al., 2016). Females in the Middle East have higher interest in using mobile phones and applications for social and entertaining activities than are South Asian countries females, which is due to their lack of employment (Lobo and Elaluf-Calderwood, 2012). It can be argued that affordability is an important factor in this process. A higher income female can afford to obtain a mobile phone and use mobile internet more frequently than lower income level females. Previous studies found that higher income females are able to enjoy using different mobile applications, since they can afford to access mobile internet (Srinuan et al., 2012; Komunte, 2015). This relates to mobile applications usage in many countries in the Middle East where there are high costs for mobile internet access (Gelvanovska et al., 2014; GSMA, 2018a). Thus:

H4. Income moderates the effect of hedonic motivation on behavioural intention towards mobile phones and mobile applications so that its influence is stronger among females on a higher income.

3.2.5 Facilitating conditions (FC)

Facilitating conditions reflect the training, support and resources presented to consumers to use different technologies (Venkatesh et al., 2012) which can have an important influence on technology use in the Middle East (e.g., Alwahaishi and Snášel, 2013). Existing studies revealed that this factor acts as a predictor of usage of various technological systems (Maillet et al., 2015; Madigan et al., 2017; Arif et al., 2018). Training and support for using mobile phones and mobile applications is especially significant for females as they seem to need it more than men do (Venkatesh et al., 2012). However, this varies among females on different levels of income. Lower income females have less chances to afford using a mobile phone and, more importantly, mobile applications due to the high price of access to the mobile internet in some Middle Eastern countries (GSMA, 2018a); therefore, they may also lack the resources and training required to use smartphones and mobile applications effectively. It follows that these females are less likely to appreciate the significance of smartphones and applications. Therefore, higher income females may perceive facilitating conditions as more significant than men do. Hence:

H5a. Income moderates the effect of facilitating conditions on behavioural intention towards using mobile phones and mobile applications so that its influence is stronger among females on a higher income.

H5b. Income moderates the effect of facilitating conditions on the use of mobile phones and mobile applications so that its influence is stronger among females on a higher income.

3.2.6 Habit (HT)

Habit is developed due to frequent use of different technologies (Venkatesh et al., 2012; Madigan et al., 2017; Raza et al., 2019). Habit was found an important factor affecting technology use (Limayem et al., 2007; Ameen and Willis, 2018a; Tarhini et al., 2016; Yahia et al., 2018). Existing research showed that habit is linked to the frequency of using technology as when consumers use technology frequently, the automatic use of this technology starts developing (Gupta et al., 2018; Palau-Saumell et al., 2019; Ramírez-Correa et al., 2019; Christino et al., 2019). Hence, consumers with a higher access level can develop a higher level of habit in using mobile phone phones. Habit has been found to be less important among females than among males (Venkatesh et al., 2012) because of the lower level of mobile phone use among women (GSMA, 2015). Similarly, lower income females may not be exposed to such technology. Thus:

H6a. Income moderates the effect of habit on behavioural intention towards using mobile phones and mobile applications so that its influence is stronger among females on a higher income.

H6b. Income moderates the effect of habit on the use of mobile phones and mobile applications so that its influence is stronger among females on a higher income.

3.2.7 National IT development (ND)

National IT development and policies refer to policies and ICT infrastructure at a national level which can influence consumers' use of technology (Straub et al., 2001; Wu et al., 2007),

including smartphones (Ameen and Willis, 2018a). Previous research emphasised the impact of policy making and government role in technology use and innovation (Hall and Khan, 2002; Maynard, 2007; Zagami et al., 2018). In particular, the GSMA 2017 report highlighted the impact of national policies on individuals' use of different technologies including mobile technologies (GSMA, 2017b). Such policies can cover, supply and demand of IT, putting boundaries on different mobile applications and acceptable tariffs (Loch et al., 2003). Thus, the factor can predict consumers' intention and use of mobile phones and mobile applications (Loch et al., 2003; Ameen and Willis, 2018a). In addition, we hypothesise that the level of national IT development and the policy approach have a significant effect on facilitating conditions among females on a higher income level. This is because in order to make any training or resources available for using smartphones and the mobile internet, a sufficient level of supporting national IT infrastructure and policy approach is needed (GSMA, 2017b) which can have a higher influence on females on a higher income level due to the higher chances of access. Since females on a higher income have more opportunities to use mobile phones and mobile applications, the impact of this antecedent on intention, use and facilitating conditions may be more significant among them. Thus, we hypothesise:

H7a. Income moderates the effect of national IT development on behavioural intention towards using mobile phones and mobile applications so that its influence is stronger among females on a higher income.

H7b. Income moderates the effect of national IT development on facilitating conditions for using mobile phones and mobile applications so that its influence is stronger among females on a higher income.

H7c. Income moderates the effect of national IT development on the use of mobile phones and mobile applications so that its influence is stronger among females on a higher income.

3.2.8 Perceived relative advantage (PRA)

Perceived relative advantage refers to the advantages consumers can obtain from using a particular technology and whether it is more beneficial than other technologies (Rogers, 2003; Johnson et al., 2018). Previous studies showed that perceived relative advantage has a higher level of accuracy than perceived usefulness and performance expectancy, despite that they have been used interchangeably as it allows a comparison of the benefits of a given technology to the benefits of other technologies (Mndzebele, 2013; Ameen, 2017). The significance of relative advantage has been highlighted in existing research as the assessment of the potential benefits of a certain technology can be a motivator for individuals to use it (e.g. Wang et al., 2008; Mndzebele, 2013). Since various technologies are available for consumers to use, they often compare these technologies in terms of their benefits (Wang et al., 2008). This factor is generally less significant among females than among men (Karjaluoto et al., 2010; Ameen, 2017). Nevertheless, the effect of perceived relative advantage may be stronger among females on a higher level of income. Because these females may have more access to smartphones and mobile applications, they may be more able to recognise their benefits. Thus:

H8. Income moderates the effect of perceived relative advantage on behavioural intention towards using mobile phones and mobile applications so that its influence is stronger among females on a higher income.

3.2.9 Price value (PV)

Price value refers to the comparison between the benefits obtained from using technology in comparison to the cost of its use (Gupta et al., 2018; Pan et al., 2018). The financial independence of Middle East females is often limited, with many females often on a lower income (Ameen and Willis, 2018b). When combined with other cultural factors, this results in females being more price sensitive (GSMA, 2017a). Hence, price value affects intention to use mobile phones and mobile applications among these females, especially those who are on a lower income, price of mobile phones and the mobile internet is an important factor for them. Females' participation in the labour force varies among the three countries of this study, with the lowest in Jordan (19%) and the highest in the UAE (41%) (World Bank, 2017b). Hence, the effect of price value may be more significant among Jordan and Iraq females than in the UAE. Thus, we hypothesise:

H9. Income moderates the effect of price value on behavioural intention towards using mobile phones and mobile applications so that its influence is stronger among females on a lower income.

3.2.10 Social influence (SI)

Social influence reflects how consumers are influenced by the opinions of others around them such as family members and friends to different technologies (Raza et al., 2018; Ameen et al., 2018). The opinions of family members and friends can have a more significant effect among females than among males (Karjaluoto et al., 2010; Sathye et al., 2018). This factor may also have a strong effect among females, because females compare themselves directly with other females (Swiatkowski, 2016). It also links to the density of the connection between self-esteem and social comparison (Hynes and Wilson, 2016). This, combined with the collectivistic culture

of Arab society (Hofstede, 2018) makes the effect of social influence even stronger for women in the region (Shen et al., 2009). Social influence may be more significant among females on a higher income, as they are more able to afford to buy a smartphone and subscribe to the mobile internet (Sekabira and Qaim, 2017). Therefore, we hypothesise:

H10. Income moderates the effect of social influence on behavioural intention towards using mobile phones and mobile applications so that its influence is stronger among females on a higher income.

3.2.11 Technological culturation (TC)

Technological culturation refers to the experience consumers have when travelling to more advanced cultures in terms of technology usage (Straub et al., 2001). It was found a predictor in previous studies on technology transfer to the Middle East (e.g. Loch et al., 2003; Mohtaramzadeh et al., 2018; Ameen and Willis, 2018a). This could be attributed to Arab females gained experience in more technologically advanced cultures, which is a form of informal technological culturation. This could refer to travelling to another country for pleasure (Straub et al., 2001; Mohtaramzadeh et al., 2018; Ameen and Willis, 2018a) and may change the ways that individuals use their mobile phones and various mobile applications. Previous studies showed that consumers use different types of advanced technologies when they travel abroad (Chang et al., 2016; Huang et al., 2017; González-Reverté et al., 2018). This form of technological culturation is classified as informal culturation as it is developed through informal travel experiences rather than business ones (Straub et al., 2001). Recent studies revealed that income plays an important role in individuals' decision making in terms of travelling (Djeri et al., 2014). Hence, this can be applicable to higher income females, as they are more able to afford to travel abroad. Thus, we hypothesise:

H11. Income moderates the effect of technological culturation on behavioural intention towards using mobile phones and mobile applications so that its influence is stronger among females on a higher income.

4. Research methodology

To determine the link between gender, income, mobile phones and mobile applications in this quantitative study we formed hypotheses that needed to be validated in real life, which led to the application of quantitative methods; namely, a close ended Likert scale, hard copy questionnaire. The theory that was used to form the hypothesis was tested by the formed hypotheses, which suggested the application of a deductive approach.

4.1 Measurements

Since Middle Eastern countries were targeted, Arabic is the official and widely spoken language, 900 hard copy questionnaires (translated into Arabic) were distributed and included measures for each construct in the conceptual framework. A seven-point Likert scale was used in the questionnaire (from strongly disagree (1) to strongly agree (7)) which were applied in previous studies on technology adoption (e.g., Venkatesh et al., 2012; Ameen and Willis, 2018; Liébana-Cabanillas et al., 2018). Appendix A provides the measurement items and their sources. The factors integrated in the model were technological culturation, national IT development, facilitating conditions, hedonic motivation, culture-specific beliefs and values, price value, social influence, habit, perceived relative advantage, effort expectancy and behavioural intention. The items were adopted from Straub et al. (2001), Loch et al. (2003) and Venkatesh et al.'s (2012) studies. In addition, the factor actual use was measured based on the frequency of usage of different mobile applications namely: mobile phone (for making calls),

text messages, mobile Internet, games, mobile e-mail, mobile messaging apps (Viber, Skype or WhatsApp), mobile social media, mobile banking and m-commerce, following Venkatesh et al.'s (2012) study. The sample from each country was divided to two different groups: the lower-income group (less than $10,000) and the higher-income group (which included the other income categories). The income categories used to differentiate between the lower-income group and higher-income group are the same in all three countries. This allows a more accurate comparison between the samples. A pilot study took place in Iraq among a sample of 33 females in the city of Erbil. Accordingly, some questions were changed. In addition, institutional ethical approval was obtained, and the authors ensured that the data obtained about the participants is private and confidential with no personal data included.

4.2. Data collection

This study focuses on females aged 18–29 in Iraq, the UAE and Jordan, since the young individuals segment is a major in the population of the Middle East (World Population Review, 2019). The distribution of the questionnaires was done by hand in all the communities in selected districts in each of the three countries using multi-stage cluster sampling which is often used in studies conducted in developing countries (Kumar and Indrayan, 2002). The face-to-face distribution of the questionnaire allowed the researchers to reach a higher response rate as online questionnaires often have lower response rate. In addition, the distribution of online questionnaires is not common in Iraq and Jordan. Hence, the first author distributed the questionnaires in households in each of the three studied countries. The research focused on females aged 18–29 in Iraq, the UAE and Jordan. The authors focused on this particular group as the largest segment in the Middle East is formed of young people (World Population Review, 2019). Females account for 49.6% of the population in the Middle East and of that

percentage 20% are young (Global Female Leaders, 2018). The questionnaire was distributed face to face to females aged 18–29 years in three districts in Dubai (UAE), Amman (Jordan) and Erbil (Iraq). Three districts that had large female populations were selected in each of the three cities. In total, there were 228 responses from Jordan, 195 responses from Iraq and 206 responses from the UAE. This lead to a response rate of 50% in Iraq, 57% in Jordan and 52% in the UAE. Table 3 shows the demographic data related to the assessed samples. All the respondents in the three countries were mobile phone owners.

Table 3
Descriptive statistics for data

	Iraq (%)	Jordan (%)	UAE (%)
Age			
18–22	52.6	44.7	71.4
23–29	47.4	55.2	28.6
Education			
High school	2.7	0.0	1.9
Diploma	20.4	7.5	10.7
Bachelor level	59.6	27.6	18.4
Master level	8.6	57.0	64.6
Doctoral level	8.7	7.9	4.4
Income			
Less than $10,000	112	123	105
$10,000 to $19,000	50	71	16
$20,000 to $29,000	24	22	20
$30,000 to $39,000	5	5	35
$40,000 to $49,000	2	3	15
$50,000 or more	2	4	15

The respondents from Iraq were females aged 18–29: 52.6% were aged 18–22 and 47.4% were aged 23–29. The respondents from Jordan were females aged between 18 and 29 years: 44.7% were aged 18–22 and 55.2% were aged 23–29. Respondents in the UAE were also within this age range (18–29): 71.4% were aged 18–22 and 28.6% were aged 23–28.

The respondents in Iraq had the following education levels: 2.7% were at the high school level, 20.4% were at the diploma level, 59.6% were at the bachelor's degree level, 8.6% were at the master's degree level and 8.7% were at the doctoral degree level. In terms of education levels, all the Jordanian females were above the high school education levels: 7.5% were at the diploma level, 27.6% were at the bachelor's degree level, 57% were at the master's degree level and 7.9% were at the doctoral degree level. In the UAE, 1.9% of the females were at the high school level, 10.7% were at the diploma level, 18.4% were at the bachelor's degree level, 64.6% were at the master's degree level and 4.4% of them were at the doctoral degree level. Previous research has shown that although Arab females may be educated, education may not enable Arab females to access the job market (World Bank, 2016). This has an impact on the level of income that females in these countries are able to earn. In other words, it is not necessary that a woman with a high education level would be on high income levels. There are six categories for the income variable. These categories are adopted from previous studies (Ameen, 2017).

4.2 Data analysis

Collected data was also assessed in terms of outliers and normality. Normality was assessed using skewness and kurtosis (Pallant, 2010). When skewness and kurtosis values are higher than +1 or less than -1, data can have normality issues (Hair et al., 2014). The results show that a non-normal distribution of the data. Nevertheless, no major issues were identified. In addition, common method variance has an adverse influence on the validity of the data (Hair et al., 2017). We assessed common method variance using Harman's single factor test in SPSS (Gefen et al., 2011). The analysis showed that this is not an issue in the collected data.

The data was also assessed in terms of outliers and normality. Partial least squares-structural equation modelling (PLS-SEM) was used to analyse the data. The analysis was conducted using Smart PLS software (v3.2.7). Partial least squares-structural equation modelling (PLS-SEM) was selected as a method of analysis because it can handle data that is not normally distributed (Henseler et al., 2009; Dijkstra and Henseler, 2015; Hair et al., 2017). In addition, the PLS-SEM method is appropriate for this research as it enables estimating complex models with many constructs, indicator variables and structural paths without imposing distributional assumptions on the data (Hair et al., 2017). This method of data analysis is carried out in two stages: first, assessing the measurement model, and second, assessing the structural model (Hair et al., 2017). Because this research studies the moderating effects of income, we also used partial least squares-multi group analysis (PLS-MGA) (Henseler et al., 2009) to assess the moderating effects on the relationships between the exogenous and endogenous factors in the proposed model. Researchers can conclude that there are significant differences between the paths in the groups if the *p* value is 0.05 or lower or 0.95 or higher indicate (Henseler, et al., 2009). These threshold values were adopted in recent studies (e.g. Valaei and Baroto, 2017; Ameen et al., 2018a; Widjaja et al., 2019). Hence, these values were used in this research to confirm or reject a hypothesis.

5. Results

5.1 Measurement model

The analysis of the measurement model started with convergent validity and discriminant validity (Hair et al., 2017). The analysis shows that the average variance extracted (AVE) values are above 0.5 which is the acceptable threshold value (Hair et al., 2017). In addition, the analysis shows that all values of Cronbach alpha (CR) are higher than the threshold value of

0.7 (Hair et al., 2017). The factor loadings were also assessed, which revealed that the factor loadings were above 0.70 (Hair et al., 2014). This suggested that the overall reflective items which had loadings higher than 0.70 were kept. Table 4 provides the findings for of the assessment of validity and reliability.

Table 4

Assessment of validity and reliability: Iraq, Jordan and UAE.

	Iraq			Jordan			UAE		
	CR	Composite Reliability	AVE	CR	Composite Reliability	AVE	CR	Composite Reliability	AVE
BI	0.868	0.910	0.718	0.909	0.937	0.790	0.947	0.962	0.862
CSBV	0.830	0.897	0.745	0.908	0.943	0.846	0.905	0.940	0.840
EE	0.920	0.940	0.757	0.945	0.958	0.821	0.944	0.957	0.819
HM	0.862	0.914	0.781	0.913	0.945	0.852	0.737	0.813	0.620
FC	0.871	0.903	0.610	0.856	0.893	0.584	0.869	0.903	0.613
HT	0.761	0.863	0.677	0.832	0.898	0.747	0.890	0.932	0.820
PRA	0.902	0.931	0.772	0.935	0.954	0.838	0.778	0.863	0.646
PV	0.903	0.926	0.676	0.847	0.887	0.580	0.878	0.908	0.626
SI	0.857	0.913	0.777	0.884	0.928	0.812	0.892	0.931	0.819

The results of the analysis did not reveal any issues in terms of factor loadings. The lowest factor loading in all three samples is 0.696 (in the Jordanian sample), while the remaining values ranged from 0.712 to 0.901; therefore, they are all retained. In addition, no issues were found with regards to discriminant validity (Hair et al., 2006). For the formative factors (technological culturation, national IT development and policies and use, collinearity was examined using the variance inflation factor (VIF) value and the tolerance value. No issues were detected in the three samples, as VIF values are less than 5 and tolerance values are above 0.20 (Hair et al., 2017). The three samples had VIF values varying from 1.96 to 2.95.

5.2 Multi-group analysis

There are 112 Iraqi females in the lower-income group and 83 females in the higher-income group. In the Jordanian sample, there are 123 females in the lower-income group and 105 females in the higher-income group. There are 105 females in the lower-income group and 101 females in the higher-income group in the UAE sample. The R^2 values for behavioural intention and use in the lower-income group in the Iraqi sample are 0.795 and 0.582. Hence, the model can explain 80% in behavioural intention and 58% in use in Iraq. The assessment of R^2 values showed that the model can explain 83% in behavioural intention and 37% in use in the higher-income group in the Iraqi sample. The R^2 values for behavioural intention and usage among the lower-income group in the Jordanian sample are 0.793 and 0.594 respectively. Hence, the model can explain 79% of intention and 59% of use. The R^2 values showed that the model can explain 85% in behavioural intention and 70% in use in the higher-income group in the Jordanian sample. The R^2 values for behavioural intention and use among the lower-income group in the UAE sample are 0.839 and 0.612 respectively. Hence, the model can explain 84% of behavioural intention and 61% of use. The R^2 values showed that the model can explain 85%

in behavioural intention and 57% in use in the higher-income group in the UAE sample. Table 5 shows the results of the PLS-MGA analysis in all three countries.

Table 5

PLS-MGA analysis in the Iraq, Jordanian and the UAE samples.

Hypothesis	Relationship	Iraqi sample				Jordanian sample				UAE sample			
		Group (1) lower income users	Group (2) higher income users	p value (group (1) vs group (2))	Results	Group (1) lower income users	Group (2) higher income users	p value (group (1) vs group (2))	Results	Group (1) lower income users	Group (2) higher income users	p value (group (1) vs group (2))	Results
		p value	p value			p value	p value			p value	p value		
H1	BI -> USE	0.056	0.044	0.659	Not supported	0.003	0.009	0.171	Not supported	0.025	0.021	0.952	Supported
H2a	CSBV -> BI	0.000	0.098	0.029	Partially supported	0.168	0.119	0.549	Not supported	0.482	0.386	0.565	Not supported
H2b	CSBV -> USE	0.004	0.123	0.309	Not supported	0.330	0.186	0.386	Not supported	0.559	0.548	0.425	Not supported
H3a	EE -> BI	0.019	0.674	0.050	Supported	0.040	0.831	0.050	Supported	0.619	0.088	0.872	Not supported
H3b	EE -> PRA	0.000	0.000	0.953	Supported	0.000	0.000	0.677	Not supported	0.088	0.000	0.970	Supported
H4	HM -> BI	0.713	0.776	0.524	Not supported	0.145	0.347	0.200	Not supported	0.347	0.002	0.959	Supported
H5a	FC -> BI	0.580	0.310	0.704	Not supported	0.736	0.043	0.953	Supported	0.158	0.016	0.981	Supported
H5b	FC -> USE	0.341	0.869	0.307	Not supported	0.639	0.813	0.279	Not supported	0.036	0.414	0.022	Partially supported
H6a	HT -> BI	0.489	0.351	0.094	Not supported	0.110	0.845	0.089	Not supported	0.700	0.637	0.554	Not supported

H6b	HT -> USE	0.499	0.472	0.837	Not supported	0.419	0.002	0.951	Supported	0.159	0.045	0.962	Supported
H7a	ND -> BI	0.916	0.626	0.373	Not supported	0.006	0.001	0.806	Not supported	0.001	0.006	0.332	Not supported
H7b	ND -> FC	0.001	0.000	0.978	Supported	0.000	0.000	0.980	Supported	0.001	0.000	0.478	Not supported
H7c	ND -> USE	0.462	0.747	0.286	Not supported	0.396	0.003	0.963	Supported	0.000	0.219	0.050	Partially supported
H8	PRA -> BI	0.050	0.060	0.024	Partially supported	0.021	0.038	0.179	Not supported	0.000	0.004	0.013	Partially supported
H9	PV -> BI	0.018	0.054	0.043	Supported	0.048	0.692	0.038	Supported	0.000	0.048	0.034	Supported
H10	SI -> BI	0.931	0.670	0.593	Not supported	0.741	0.716	0.307	Not supported	0.299	0.992	0.217	Not supported
H11	TC -> BI	0.014	0.010	0.688	Not supported	0.857	0.549	0.708	Not supported	0.295	0.422	0.097	Not supported

The results of the multi-group analysis show differences in the significance of the paths between the two groups (group 1: women on a lower income level and group 2: women on a higher income level) in the three studied countries. The results regarding H1 (BI -> USE) show that while there were no significant differences between the two groups in Iraq and Jordan (*p* values are 0.659 and 0.171 respectively), there were significant differences between them in the UAE (*p* value= 0.952), showing that the path between BI and USE is more significant among women on a higher income level in the UAE.

The findings showed that there are no significant differences between the two groups in each of the three countries in H2a (CSBV -> BI) and H2b (CSBV -> BI) except in the differences in H2a (p value = 0.029) in Iraq, showing that the effect of CSBV on BI is more significant among women on a lower income level. In addition, the results showed some differences between the two groups in the three countries in terms of H3a (EE -> BI) and H3b (EE -> PRA). While H3a was supported in Iraq (*p* value = 0.050) and in Jordan (*p* value = 0.050), it was not supported in the UAE (*p* value = 0.872). While H3b was supported in Iraq (p value = 0.953) and UAE (p value = 0.970), it was not supported in Jordan (*p* value = 0.677).

The results showed differences in the results of the analysis of the data regarding H4 (HM -> BI) showed that it was not supported in Iraq (*p* value = 0.524) nor in Jordan (*p* value = 0.200) but it was supported in the UAE (*p* value = 0.959). The results also showed differences in H5a (FC -> BI) and H5b (FC -> USE). While H5a was not supported in Iraq (p value = 0.704), it was supported in Jordan (*p* value = 0.953) and in the UAE (*p* value = 0.981). H5b was not

supported in Iraq (*p* value = 0.307) and Jordan (*p* value = 0.279) but it was partially supported in UAE (*p* value = 0.022).

The findings showed that H6a (HT -> BI) was not supported in any of the three countries: Iraq, Jordan and the UAE (*p* values are 0.094, 0.089 and 0.554 respectively). In addition, H6b (HT -> USE) was not supported in Iraq (*p* value = 0.837) but it was supported in Jordan (*p* value = 0.951) and in the UAE (*p* value = 962). Furthermore, the findings showed that H7a (ND -> BI) was not supported in any of the three countries: Iraq, Jordan and the UAE (*p* values are 0.373, 0.806, 0.332 respectively). In terms of H7b (ND -> FC), the findings showed that it was supported in Iraq (*p* value = 0.978) and in Jordan (*p* value = 0.980) but it was not supported in the UAE (*p* value = 0.478). In terms of H7c (ND -> USE), the findings showed that it was not supported in Iraq (*p* value = 0.286), partially supported in Jordan (*p* value =0.963) and supported in the UAE (*p* value =0.050).

The results revealed that H8 (PRA -> BI) was partially supported in Iraq (*p* value = 0.024) and in the UAE (*p* value = 0.013), while it was rejected in Jordan (*p* value = 0.179). H9 (PV -> BI) was supported in all three countries: Iraq, Jordan and the UAE (*p* values are 0.043, 0.038 and 0.034). H10 (SI -> BI) was rejected in all three countries: Iraq Jordan and the UAE as no differences were found between the three groups (*p* values are 0.593, 0.307 and 0.217), similarly, H11 (TC -> BI) was rejected in all three countries (*p* values are 0.688, 0.708 and 0.097).

6. Discussion

The research aimed to expand knowledge on female consumers' use of mobile phones and mobile applications in developing countries. The context of this study is the Middle East where

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these factors are pertinent for females. Hence, the study used a quantitative approach that involved using multi-stage cluster sampling to distribute hard copy questionnaires in the Jordanian, Iraqi and UAE households which led to 629 replies from female consumers aged 18–29. The findings of this research reveal that price is not the most major barrier to females' usage of mobile phones and mobile applications in Arab countries. This contradicts the majority of previous studies and reports, which explain that low income is the largest challenge to females' effective use of mobile phones in less developed countries (GSMA, 2017a; GSMA, 2018a; Radosevie and Yoruk, 2018; Burjorjee and Bin-Humam, 2018). This is further supported by the low significance of price value as a factor affecting behavioural intention in comparison with the other predictors. The findings reveal that price value is not the most significant antecedent of intention in any income group of females in any of the three countries studied. Therefore, other factors should be considered. Culture, society, national IT development and inclusive policies play a key role in using smartphones, but they are not supportive in these countries; thus, hindering economic development for these females and their households.

Income moderates the effect of culture-specific beliefs and values (more specifically, offline vs mobile-mediated meetings) on behavioural intention among females. However, the factor does not moderate this relationship in Jordan or the UAE. Mobile-mediated meetings are important for Iraqi females on a lower income. The results also show that in all three countries, income does not moderate the effect of this factor on use of mobiles. However, Iraqi females on a lower income find mobile-mediated meetings to be important for their use of mobile technologies. Even though they may have less access to mobile technology (Sekabira and Qaim, 2017), these females still prefer mobile-mediated meetings that can take place through

various applications services, for instance Viber, WhatsApp and Skype. In fact, this factor is the most significant of all for Iraqi females on a lower income. This indicates a transformation in culture and a change in social life for these Iraqi females, as they prefer to use technology than to meet face to face.

Our findings indicate that important differences exist between females on lower and higher income levels in terms of how effort expectancy affects behavioural intention and perceived relative advantage. Iraqi and Jordanian females on a lower level of income find ease of use of mobile phones and mobile applications to be an important factor for their use. However, this factor is insignificant among the two income groups of females in the UAE. This is possibly due to the experience Emirati females have gained in using mobile phones and applications, which reduces the influence of effort expectancy on behavioural intention (Ameen and Willis, 2018a). The influence of effort expectancy and perceived relative advantage is moderated by income among Iraqi and Emirati females which suggests that the easier smartphones and mobile applications are to use, the more likely these females are to become aware of and experience the advantages. This links to the accessibility issue as found in previous studies (e.g. Sung et al., 2015; Sekabira and Qaim, 2017).

Habit is an important factor affecting mobile phones usage among higher-income Jordanian and Emirati females. In addition, income is not a moderator of the relationship between national IT development and policies and intention in any of the studied countries. However, Iraqi, Jordanian and Emirati females in both income groups find that national IT development and policies have an important influence on facilitating conditions. The influence of national IT development and policies is significant among females on both income levels in all three countries. This shows that a sufficient level of national IT development and effective policies

are essential for the support and resources available for using smartphones and mobile applications to work. It also shows that there is a need to restructure policies to create an environment that supports females to use smartphones and mobile applications more effectively. The significance of this factor on the use of mobile phones and mobile applications is among females in the higher-income group in Jordan and the lower-income group in the UAE only. This supports previous studies that highlight the importance of national IT infrastructure and policies (Straub et al., 2001; Ameen and Willis, 2018a).

The findings suggest that income moderates the influence of perceived relative advantage on intention among females on both lower and higher incomes in Iraq and the UAE. In these two countries, the relationship is more significant among females on a lower income. However, in Jordan no major differences were found among females on the lower and higher levels of income. Also, income moderates the effect of price value on intention towards the use of smartphones and mobile applications in all three countries. Price value is a significant factor for females on the lower level of income. This links to the issue of affordability, which has been highlighted in previous work (GSMA, 2017a; Ameen and Willis, 2018b). Nevertheless, the significance of price value is not the highest among the females in any of the studied countries included in this study. Hence, other factors are more significant in predicting these females' intention to use of mobile phones.

We found that income is not a significant moderator of the effect of social influence and behavioural intention in any of the three countries. More importantly, we found that social influence is not an important factor predicting intention to use mobile phones and mobile applications among females in the three countries. This may suggest a shift in society away from valuing others' opinions. Iraqi females on lower and higher levels of income find that

technological culturation is a significant predictor of their behavioural intention towards the use of mobile phones.

6.1 Theoretical contributions

The contributions of this research can be summarised in four main ways in terms of theory. First, we extended prior work on the adoption of individual types of mobile applications for either mobile commerce (Li and Ho, 2015), mobile banking (Alalwan et al., 2015; Alkhaldi, 2017), mobile social media (Baabdullah, 2018) by proposing a new integrated model combining the UTAUT2 (Venkatesh et al., 2012) and the cultural influence model (Straub et al., 2001) focusing on the use of mobile phones and different mobile applications. The findings reveal that the model proposed in this study fits well in each of the studied countries. Integrating new cultural and national IT development and policies factors provides a better explanation and richer insights than the UTAUT2 model on its own.

Second, while previous research mainly focused on studying age and gender as moderators when using technology (e.g. Venkatesh et al., 2012), the research bridges a gap in research by investigating how income affects Arab female consumers' use of mobile phones and mobile applications as a moderator in a cross-national context. Our findings reveal that income plays a more significant moderating effect in the context of female consumers' use of smartphones and mobile applications in more technologically advanced countries. Surprisingly, our findings show that the moderating role of income is less significant among female consumers in less developed countries.

Third, the research provides new findings regarding the effects of cultural factors and national IT development and policies among female consumers on different income levels in Middle

Eastern countries. Furthermore, the effects of cultural factors including culture-specific beliefs and values and technological culturation are more significant among female consumers on a lower income level in less developed countries (i.e. Iraq) than in higher income countries (i.e. Jordan and UAE).

Fourth, while previous studies highlighted the significant role of facilitating conditions on individuals' behavioural intention towards technology adoption as part of the UTAUT2 model (Alwahaishi and Snášel, 2013; Liébana- Cabanillas et al., 2018), this research offers empirical support for the role of national IT development and policies as an antecedent of facilitating conditions for female consumers' decision making to use mobile phones and mobile applications. The findings of this research revealed that national IT development is an antecedent of facilitating conditions among both females on higher and lower income levels. Hence, for Arab female consumers, training and support may not be sufficient without the existence of national IT development and policies that provision female consumers' use of these technologies.

6.2 Implications for industry

The study shows that the cost of mobile phones and mobile internet is an important factor for female consumers, especially those who are on a low income in higher middle-income countries. Hence, the reduction of the price of the mobile internet is required. However, price is not the most significant factor predicting female consumers' use of mobile technology. Other factors should also be taken into consideration. Enabling important mobile services can improve the way companies (including retailers) communicate with their female consumers and market their products to their female consumers using different mobile applications. Thus,

the study offers important findings in terms of the significance of different factors among female consumers on different income levels in the three countries under study.

One of the most important implications of this research is the influence of national IT development and policies on facilitating conditions of mobile phones and mobile internet usage. The findings suggest that Arab female consumers think that if training and a supportive environment are to be provided effectively, the ICT infrastructure and policies in a given country have to be in place. Creating more inclusive IT policies to empower females in the digital age and protect their privacy and confidential information is important. Implementing effective policies and government initiatives is required to acknowledge the role of females in creating a more advanced and well-informed society. In addition, it improves the quality of life and welfare for these females.

Providing females with targeted, appropriate training on the efficient and secure methods of using mobile applications is important. This will help them to gain sufficient experience in the effective use of smartphones, which will make using mobile phones and mobile applications easier. In turn, this may increase their awareness of the benefits they can gain from using various mobile services. This will also help to break down traditional gender hierarchies and widen the distribution of power in Arab society.

Females in Iraq have a strong preference for mobile-mediated meetings via VoIP applications, such as Viber, WhatsApp and Skype. This preference is especially strong in the case for Iraqi females on a low income. Hence, reducing the price of mobile internet services in Iraq is important to allow this group of females to use mobile applications effectively. Allowing

females to be more economically independent is important, as these applications could assist females to run a business.

7. Conclusions and future research

Gender and income are two important factors for consideration in adoption studies. There have been studies examining these factors, but few focused on the Middle East that motivated this team to form a conceptual framework and utilise empirical research to fulfil the aim: to expand knowledge on female consumers' use of mobile phones and mobile applications in developing countries. This framework was then tested using empirical data collected from three Middle Eastern countries where females and income are pertinent factors of consideration, which are Jordan, Iraq and UAE. From our research we found that cost is not the most significant barrier to females' usage of mobile phones in developing countries. What was also found is that cost is not the most important predictor of intention in all income groups of females in any of the studied three countries. Instead, other factors should be considered. Culture, society, national IT development and inclusive policies play a key role in using mobile phones. The aforementioned factors have a pertinent role such that they prevent support for females in these countries, thus hindering economic development for these females and their households.

7.1 Limitations and future research

Although the sample included females who were highly educated, it did not include a large number of participants from the higher-income groups, especially in Iraq and Jordan. This is linked to the overall low-income levels of females as the norm is females are more housewives, which led to the finding that education is not always linked to a high growth in income for females in these two countries. Future research can collect more data from women on higher

incomes and compare the results. In addition, we focused on females aged 18–29 years, which is an important segment of the Arab population. Future research can focus on females from older groups, test the effects of income and conduct a comparison of the results with those of our study. Furthermore, we focused on specific income groups. Future research can include other income categories. Finally, future studies can test the effects of income level on female's usage of mobile phones and mobile applications in other world regions with a significant gender gap in mobile internet usage (such as South Asia) and compare the findings with those of this research.

Appendix A

Factors included in the proposed research model

Item by variable	Adapted from (with minor modifications to fit the context of the study)
Technological culturation	Straub et al. (2001)
I find that due to the extent of travel for pleasure it is important to use technology.	
I find that reading in foreign technology journals supports the use of technology.	
I find that training provided from foreign companies in my country is helpful for using technol	
National IT development	Loch et al. (2003)
I find that the current demand for IT is high.	
I find that the current supply of IT is high.	
Government IT initiatives in policy making are working well.	

I find current mobile tariffs acceptable.

I find that currently there are no restrictions to using different mobile applications.

Facilitating conditions   Venkatesh et al. (2012)

I have the resources necessary to use mobile phones.

I have the resources necessary to use mobile applications.

I have the knowledge necessary to use mobile phones.

I have the knowledge necessary to use mobile applications.

My mobile phone is compatible with other technologies I use.

I can get help from others when I have difficulties in using mobile phones.

Hedonic motivation   Venkatesh et al. (2012)

Using mobile phones is fun.

Using mobile phones is enjoyable.

Using mobile phones is very entertaining.

Culture-specific beliefs and values   Straub et al. (2001)

The fact that a mobile phone supports technology-mediated meetings is an important element in success or failure.

My focus on technology-mediated meetings is a factor in the final outcome.

I prefer technology (mobile) mediated meetings rather than face-to-face meetings.

Price value   Venkatesh et al. (2012)

Mobile phones are reasonably priced.

Mobile applications are reasonably priced.

My mobile phone is good value for money.

Mobile applications are good value for money.

At the current price, mobile phones provide good value.

At current prices, mobile applications provide good value.

Social influence   Venkatesh et al. (2012)

People who are important to me think I should use mobile phones.

People who influence my behaviour think I should use mobile phones.

People whose opinions that I value prefer that I use mobile phones.

Habit   Venkatesh et al. (2012)

The use of mobile phones has become a habit for me.

I am addicted to using mobile phones.

I must use mobile phones.

Perceived relative advantage   Venkatesh et al. (2012) and Moore and Benbasat (1991)

 I find that a mobile phone is useful in my daily life.

 Using a mobile phone helps me to achieve things more quickly.

 Using a mobile phone helps me to stay connected to people.

 Using a mobile phone makes it easier to carry out my daily activities.

Effort expectancy   Venkatesh et al. (2012)

 Learning how to use mobile phones is easy for me.

 Learning how to use mobile applications is easy for me.

 My interaction with mobile phones is clear and understandable.

 I find mobile applications easy to use.

 It is easy for me to become skillful at using mobile phones.

Behavioural intention to use the smartphone   Venkatesh et al. (2012)

I intend to continue using mobile phones in the future.

I will always try to use mobile phones in my daily life.

I plan to continue to use mobile phones frequently.

I envisage using mobile phones in the future.

Actual use	Venkatesh et al.'s (2012)

The usage frequency of:

Mobile phone (for making calls), SMS, Mobile internet, Games, Mobile e-mail, Mobile messaging, ap Viber, Skype or WhatsApp), Mobile social media, Mobile banking, M-commerce.

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