# Developing a Framework for Examining the Use of Mobile Transactions in Saudi Arabia: the User's Perspective

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*Abstract*—**Both the recent advances in mobile technologies and the high penetration rate of mobile communication services have had a profound impact on our daily lives, and are beginning to offer interesting and advantageous new services. In particular, the mobile transaction (m-transaction) system has emerged, enabling users to pay for physical and digital goods and services using their mobile devices whenever they want, regardless of their location. Although it is anticipated that m-transactions will enjoy a bright future, there is apparently still reluctance among users to accept mobile transactions. Besides analyzing the literature, the authors have conducted five empirical studies to develop a robust comprehensive framework that encompasses the key factors which could affect Saudi users' intentions to use m-transactions. This paper aims to summarize and discuss these studies, show how they have evolved in several stages, aiming to reach a satisfactory level of maturity and finally shed light on interesting results.**

*Keywords—Mobile Technologies; E-Commerce; M-Transactions; Conceptual Framework; Acceptance; Developing Countries*

## I. INTRODUCTION

Both the rapid advances in wireless technologies and the high proliferation rate of mobile communication services and artefacts have had a profound impact on industry, and are beginning to offer interesting and advantageous new services. In particular, the mobile transaction (m-transaction) system has emerged, enabling users to pay for physical and digital goods and services using their mobile devices whenever they want, regardless of their location. Nowadays, the number of mobile phones in use far exceeds any other technical devices used to market, sell, produce, or deliver products and services to consumers. They are supported, firstly, by mobile applications which have become especially valued in an era where time is precious and the weight attached to convenience is important, and secondly, by mobile communication technologies which have successfully penetrated consumer markets throughout the world. Consequently, these developments have opened up lucrative opportunities to retailers and service providers to use mobile commerce (m-commerce), and this has become a major driving force for the next phase of e-commerce [1, 2].

The importance of this study is accentuated by the facts that mobile commerce and its services are still in their infancy [3],

that there is little research addressing the acceptance of m-transactions from the user's perspective [2, 3, 4, 5, 6] and that there has been even less investigation of this issue in Saudi Arabia. The identification of factors that influence m-transaction adoption has significant value because m-transactions are likely to have a strong influence on business activities and consumer behaviour, as well as national and global markets [5, 7, 8]. There is still an apparent lack of acceptance of m-transaction services amongst consumers [6], and the success of m-transaction systems in Saudi Arabia depends on strong acceptance by mobile users and an interest to invest from both public and private stakeholders of mobile technology [1].

## II. LITERATURE REVIEW

Some research firms have given strong positive predictions for the growth of mobile payment services. A management consulting firm called 'Arthur D. Little', for example, forecast a growth in mobile payment services from $11.7 Billion in 2005 to $37.1 Billion in 2008 [9]. This increase would have accounted for about 8% of the gross mobile services market in 2006. In spite of these hopeful forecasts, the reality seems to be quite different, and the situation is usually disappointing for those companies offering mobile payment services. According to Gartner Group [10], in 2008 only 1% of all mobile cellular users had used mobile payment services. Thus, the real market penetration of mobile payment services deviates significantly from the predictions.

Kim et al. [7] define an m-transaction as "any payment in which a mobile device is utilized to initiate, authorize, and confirm a commercial transaction". In their study they try to examine the factors influencing the intention to use m-transactions. After reviewing the literature regarding mobile payment services, and analyzing the effects of m-transaction system characteristics and consumer-centric factors on m-transaction usage across different types of m-transaction consumers, they used the Technology Acceptance Model (TAM) as a base to propose an m-transaction research model which, in addition to TAM, contains two consumer-centric factors (i.e. *personal innovativeness* and *m-payment knowledge*) and four m-transaction system characteristics (i.e. *mobility, reachability, compatibility, and convenience*). Their results show that the strongest predictors of the intention to use m-

transactions are 'perceived ease of use' and 'perceived usefulness'.

On the other hand, the literature review reveals that there is a notable shortage of research investigating the factors influencing the intention/use of m-transactions in general [3, 6], and especially in Saudi Arabia [1, 11]. This study therefore aims to contribute to closing this gap.

With regards to other research concerning m-transactions in different countries, the researchers have summarised a number of studies as follows:

TABLE I.  A NUMBER OF M-TRANSACTION RESEARCH FINDINGS

| | Research Purpose | Methods Used | Theory/Constructs Used | Results/Finding |
|---|---|---|---|---|
| [12] | To investigate mobile usability in mobile 'private shopping' applications. | Usability test, with a sample of 11 Turkish senior year university students. | Think aloud, eye-tracking and video recording. | Significant mobile usability problems. |
| [13] | Identifying the determinants of pre-adoption of mobile payment (pre-adoption and post-adoption). | Online survey. 639 respondents (483 potential adopters + 156 adopters) | Social influence; personal innovativeness; perceived risk; perceived fee; compatibility; relative advantage ➔ behavioural intention to adopt. | Behavioural beliefs in combination with social influences and personal traits are all important determinants for mobile payment services adoption and use. |
| [7] | To examine the factors influencing the intention to use mobile payment. | Distributed survey + email survey 269 respondents who have experience of mobile payments. | Extended TAM: perceived usefulness; perceived ease of use; personal innovativeness and m-payment knowledge; mobility, reachability, compatibility, and convenience ➔ intention to use m-payment. | The strongest predictors of the intention to use m-payment are 'perceived ease of use' and 'perceived usefulness'. |
| [6] | To explore the factors determining consumers' acceptance of mobile payment services. | Online survey 1447 responses (583 with experience of mobile payment services, and 864 with no experience). | Extended TAM: perceived compatibility; perceived security; perceived usefulness; perceived ease of use; individual mobility; subjective norm; attitude towards use ➔ intention to use. | Perceived compatibility, individual mobility and subjective norm have significant impact on the intention to use mobile payment services. |
| [14] | Developing a model which explores how customer perceptions of the value offered by m-payment services influence their attitudes towards m-payment adoption. | Distributed questionnaires 263 respondents | Service (convenience, functionality, affordability and service awareness); technology (interface, self-efficacy and security); perceived usefulness; perceived ease of use ➔ intention to use ➔ use. | Cost and individual's economic status are important decision-making factors. The familiarity and general awareness of the mobile payment service positively affect the intention to use it. |
| [1] | To investigate the consumers' acceptance of mobile payment in KSA. | Distributed survey 200 respondents who are mobile phone users. | Security; unauthorized use of phone to make purchases; complexity, and limited amount of money per transaction. | Security of m-payment and unauthorised use of mobile phones are the strongest concerns. |
| [3] | To review prior literature on mobile commerce. | Conducting an exhaustive and systematic electronic search of 59 articles (23 Chinese and 36 English). | Research subjects, research theory, and adoptive factors. | TAM is the most-used theory in consumer adoption. |

## III.  RESEARCH METHODOLOGY

### A. Choice of Approach and Methodology

Choosing an appropriate research approach during the research design is a major task for researchers [15], as there are multiple methodologies to choose from. In addition, selecting an appropriate approach is a difficult task, since the field of information systems is multi-disciplinary – "Contributions to the study of information systems come from the natural sciences, mathematics, engineering, linguistics and behavioural sciences" [16]. With regards to research methodology, the term triangulation is assigned to the practice of combining two or more research methods for the purpose of building a broader picture of the phenomenon under study. This facilitates the validation of the findings, assists in explaining diverging results and compensates for the limitations inherent in a single research method. Triangulation is defined by Cohen, Manion and Morrison [17] as "the use of two or more methods of data collection in the study of some aspects of human behaviour".

On the other hand, Creswell and Clark [18] highlight the importance of mixed methods when one data source may be insufficient, and for the following additional reasons: (1) to explain initial results; (2) to generalize exploratory findings; (3) to enhance a study with a second method; (4) to best employ a theoretical stance and (5) to understand a research objective through multiple research phases. Furthermore, diversity in research methodologies (i.e. qualitative and quantitative) is considered as a major strength of information systems (IS) research. Mixing methodologies in research is considered potentially superior to a single method design [19].

Bryman and Bell [20] explain in their book the difference between quantitative and qualitative methods. Quantitative research can be interpreted as a research strategy that stresses quantification in collecting and analysing the data, involving a deductive approach to the relationship between theory and research, in which the accent is placed on the testing of theories. It has incorporated the practices and norms of the natural scientific model and of positivism in particular; and represents a view of social reality as an external objective reality. On the other hand, qualitative research can be interpreted as a research strategy that usually places greater emphasis on words rather than quantification in collecting and analysing the data, involving an inductive approach to the relationship between theory and research, in which the emphasis is placed on the formation of theories. It has rejected the practices and norms of the natural scientific model and of positivism in particular, in preference for an emphasis on the ways in which individuals construe their social world and represents a view of social reality as a constantly shifting emergent property of individuals' creation [20].

In this research, it was decided to employ a blend of quantitative and qualitative methods as well as triangulation of techniques in order to get a wider picture of the phenomenon under study (i.e. the intention to use m-transactions from Saudi users' perspective). It was decided to employ triangulation as mentioned earlier, integrating the following methods: *Descriptive/interpretive, Interviews, Surveys, Focus Group*, and *'Think-aloud' as an evaluation method (user usability test)*

to study this area. The following table (Table II) summaries the research approach, methodologies and data collection.

TABLE II.       SUMMARY OF RESEARCH APPROACH AND METHODOLOGY

| No | Methodology | Users | Literature | Tool | Sample Size |
|----|-------------|-------|------------|------|-------------|
| 1 | Qualitative analysis | ☒ | ☑ | Descriptive/ Interpretive | - |
| 2 | Qualitative analysis | ☑ | ☑ | Exploratory (1) Interviews | 40 |
| 3 | Qualitative analysis | ☑ | ☑ | Exploratory (2) Interviews | 122 |
| 4 | Qualitative analysis | ☑ | ☑ | Exploratory (3) Focus Group | 8 |
| 5 | Quantitative analysis | ☑ | ☑ | Validation (1): Questionnaire | 1008 |
| 6 | Qualitative analysis | ☑ | ☑ | Validation (2): Think-Aloud (Usability test) | 30 |

*B. Descriptive/Interpretive*

Descriptive or interpretive research usually refers to the existing literature or past achievements, in addition to actual present happenings. Hart [21] defined a literature review as "the use of ideas in the literature to justify the particular approach to the topic, the selection of methods, and demonstration that this research contributes something new". A methodological review of past literature is a critical endeavour for any academic research [22] and the need to discover what is already known in the body of knowledge prior to introducing any research study should not be underestimated [21]. Significant developments in our knowledge, and in our ability to develop theories, can be achieved through an in-depth review of this kind. A comprehensive review of past research/developments may not only lead to new visions but is also more likely to ensure that subsequent research is based on past endeavours. Researchers, furthermore, have criticized the Information Systems (IS) field for having insufficient theories and outlets for a quality literature review [23]. Moreover, Webster and Watson [22] noted that the IS field should greatly benefit from effective methodological literature reviews that are "… strengthening IS as a field of study". The strengths of this method of research lie in its capability to represent reality following an in-depth self-validating process in which assumptions/presuppositions are constantly questioned, and the understanding of the phenomena under study is refined. The weaknesses of this approach may include the problems reviewers face in understanding the results of a research with which they may be unfamiliar. Other influential matters are associated with the researchers' skills and ability to recognize their biases and assumptions. In this research, this approach was employed to review the literature related to the subject in hand.

*C. Exploratory Study (1) Interviews*

The reason for using a qualitative method in this research is that it enables the researchers to reach deeper into the experience of the participants, to find out how opinions and habits are shaped culturally in order to discover the relevant variables. In their book, Corbin and Strauss [24] summarize the benefits of qualitative research as sharing these characteristics: 'a humanistic bent', 'curiosity', 'creativity and imagination', 'a sense of logic', 'the ability to recognize diversity as well as

regularity', 'a willingness to take risks', 'the ability to live with ambiguity', 'the ability to work through problems in the field', 'an acceptance of the self as a research instrument', and 'trust in the self and the ability to see value in the work that is produced'. This research has been conducted using a grounded theory methodology (GTM) which was developed by Glaser and Strauss in 1967. Following GTM allows a qualitative method to be used which provides the following valuable characteristics: shedding light on a person's daily life experience; evaluating contributors' perspectives; investigating the interactive processes between researcher and respondents; and being descriptive based on people's words [25].

This research [26] aimed to elicit consumers' opinions i.e. what people in Saudi Arabia think and believe about adopting e-commerce. This included thoughts, beliefs and opinions. This information was gathered by asking general questions and recording notes and comments about the important ideas and concepts. The semi-structured interviews were conducted during August 2011 in Dammam and Khobar, as they are two of the main cities in Saudi Arabia, which are highly populated and have high business potential. All the participants were selected at random regardless of their age, income and gender. The researchers approached people from private and public organizations in different locations (e.g. universities, companies, schools, Internet cafes, streets and shops). However, this research is about adopting e-commerce, so the researchers had to verify that the participants were Internet users before starting the interviews. The sample size was 40 interviewees.

*D. Exploratory Study (2) Interviews*

A semi-structured interview instrument was developed in which all questions were based on the study model, a model which was an adopted version of Unified theory of acceptance and use of technology UTAUT. As before, this research [11] aimed to discover consumers' opinions about adopting and using m-transactions, and this information was gathered by asking general questions and recording notes and comments about the important ideas and concepts. For validity reasons, the instrument was extensively pre-tested and evaluated by academic and practical experts to whom copies of the interview's questions were sent for judgment. The instrument was then piloted and adjustments were made accordingly with the support of professional experts, with particular attention being given to the wording and the overall structure and presentation of the interview items. The semi-structured interviews were conducted during May/June 2012 in Saudi Arabia. The researchers aimed to interview the public with no limit on special features or demographic characteristics; hence all participants were selected at random regardless of their age, income and gender. The researchers approached people from private and public organizations in different locations as before (e.g. universities, companies, schools, Internet cafes, streets and shops), and again verified that the participants were Internet users before starting the interviews. Importantly, the interviewer clearly informed the interviewees that any data gathered would be kept anonymously and that the interviewees had the option to receive an executive summary of the study results. Furthermore, the authors aimed to record the interviews in electronic form to ease the later analysis. The sample size of these interviews was 122 interviewees.  The reliability of the

instrument was scrutinized by making sure that there were not many gaps in the collected data between different respondents. This study initially involved exploratory research using a qualitative approach. By adopting this approach the researchers were able to gain an in-depth understanding of consumers' concerns regarding adopting m-transactions in Saudi Arabia.

### E. Exploratory Study (3) Focus Group

In terms of explorative studies, focus group interviews have been suggested as a suitable method [27] and previous research has highlighted their feasibility and capability for studying innovative mobile transactions [28, 29]. The strength of the focus group interview method is that it is dynamic and interactive, so it has the ability to provide researchers with elaborated perspectives of the participants on the topic under discussion; it has been considered an especially informative way of developing a research model in a new research area [29, 30]. For the focus group members to interact successfully and work dynamically as a group, a number of important criteria need to be met in the selection of members. Stewart and Shamdasani (1990, p. 33) note that "the usefulness and validity of focus group data are affected by the extent to which participants feel comfortable about openly communicating their ideas, views or opinions" [cited in 29]. Groups that have formed naturally have proved to be particularly relaxed, thus easing the conversations amongst the participants [31]. As a result, in order to guarantee a proper discussion and interaction throughout the sessions, a naturally formed group was selected for this study with a total of 8 mobile experts. The participants knew each other as classmates, friends, co-workers or via a common hobby. Experience in online purchasing and using a mobile phone that has internet access were two factors estimated to be necessary in order for the participants to be able to discuss the relevant topic. According to Krueger and Casey [32] the recommended size for a focus group ranges from 4 to 12, therefore 8 participants were involved in this study. The majority held a postgraduate degree, and most of the participants (6 out 8) had experience of mobile transactions.

### F. Validation Study (1) Questionnaire

The variables in the developed framework were latent and could not be measured directly. Thus, a set of measurement indicators was generated to operationalize each construct, using existing indicators from previous studies when available, or adapting them if necessary. All constructs were measured reflectively. Each of the indicators was measured using a 7-point Likert-scale. These interval scales ranged from 1 – strongly disagree, 2 – disagree, 3 – disagree somewhat, 4 – not applicable, 5 – agree somewhat, 6 – agree, and 7 – strongly agree. The survey data, with regards to demographics and descriptive data, was primarily measured using nominal scales. Using the empirical data from the distributed questionnaires, the measurement properties were assessed and hypotheses were verified using the partial least squares structural equation modelling (PLS-SEM) approach [33, 34]. The PLS-SEM approach has enjoyed steady popularity as a key multivariate analysis method in management information system (MIS) research [35, 36]. Structural equation models (SEM) allow both exploratory and confirmatory modelling, meaning that they are suited to both theory development and theory testing. Confirmatory modelling usually starts with a hypothesis that is represented in a causal model. The concepts used in the model should then be operationalized to allow testing of the relationships between the concepts. The model is tested against the obtained measurement data to identify how well the model fits the data. The causal assumptions embedded in the model frequently have falsifiable implications which can be tested against the data. [37].

This approach (PLS-SEM) was chosen for the data analysis since, compared to covariance-based approaches, it is advantageous when the research model has large numbers of indicators and is relatively complex, when the measures are not well established, and/or the relationships between the indicators and latent variables may need to be modelled in different modes (e.g. formative and reflective measures) [38, 39, 40]. Furthermore, PLS may be better suited as it has fewer demands with regards to sample size and residual distributions [35, 39, 40, 41]. The software package SmartPLS [42] was used for the statistical calculations. A PLS path model consists of two elements. First, there is a structural model (also called the inner model in the context of PLS-SEM) that represents the relationships (paths) between the constructs. Second, there are the measurement models (also referred to as the outer models in PLS-SEM) of the constructs that display the relationships between the constructs and the indicator variables. In general there are two types of measurement models: one for the exogenous latent variables (i.e. those constructs that explain other constructs in the model) and one for the endogenous latent variables (i.e. those constructs that are being explained in the model) [43].

As mentioned above, model estimation delivers empirical measures of the relationships between the indicators and the constructs (measurement models), as well as between the constructs (structural model). The empirical measures enable us to compare the theoretically established measurement and structural models with reality, as represented by the sample data. In other words, we can determine how well the theory fits the data.

### G. Validation Study (2) Think-Aloud (Usability test)

Choosing the correct evaluation method is important; scientifically validated information on appropriate testing methods is valuable for usability practitioners. The Thinking-Aloud protocol is one of the most important usability evaluation methods (UEMs). It has been a key evaluation framework ever since the 1980s, and it remains important today in the Information System (IS) field [44, 45, 46]. In this study, user testing and think-aloud 'concurrent approach' methods were chosen. These methods are the best way to examine whether usability is indeed the critical factor that affects Saudi Arabian consumers' intention to use m-commerce.

The experiments took place in a typical usability lab setting in Saudi Arabia from July 2014 to September 2014. As in previous studies, all the participants were selected at random regardless of their age, income and gender. The researchers approached people from private and public organizations in different locations (e.g. universities, companies, schools, Internet cafes, streets and shops). As this research is about the usability of m-transactions on the Souq.com app, the researchers had to verify that the participants were mobile

users, familiar with mobile commerce, and had conducted a mobile transaction before, but had not used the tested application before (this was verified in the demographic section of the questionnaire). The sample size of this experiment was 30. One of the researchers (the main author) adopted the role of the evaluator in all the sessions, noting all the comments made by the users. The evaluator researcher used a stopwatch to record the time spent by each user on each task, and an observation sheet to write down the behaviour of each user and the problems discovered. After the users had finished their tasks, they were asked to rate their level of satisfaction in a System usability scale (SUS) questionnaire with a five point scale – 1 for strongly disagree and 5 for strongly agree. Bangor, Kortum and Miller [47] suggested slightly modified statements from those used in the original SUS instrument by [48]. The changes are (1) replacing the word "cumbersome" with "awkward" and (2) replacing the word "system" with "product". These studies applied this slightly modified SUS and also replaced the word "product" with "application". To add a valid assessment of what the absolute numerical score of SUS means, a 7 point adjective rating scale can be used to judge the SUS scores. This has become known as the "university grade analog" [47]. This study applied this technique and again replaced the word "product" with "application". Each participant conducted the experiment individually and the researcher ensured that every participant felt at ease whilst performing the tasks. Furthermore, users were given a chance to fill in an open-ended questionnaire by writing down their comments and feedback on the application, and explaining any reaction that was observed during the test. Subsequently, the researcher extracted the problems from the observer sheet and they were merged into a final master problem list.

## IV. RESULTS AND DISCUSSION

### A. Exploratory Study (1) Interviews

The findings of this study can be divided into two main categories that both play a significant role, from a consumer perspective, in the adoption of e-commerce. The first is 'Enablers', which is comprised of 10 factors: Internet and Infrastructure, security, trust, cyber law, awareness and perceived usefulness, postal services, government e-readiness, the presence of commercial electronic websites, and warranty. Some of these need more improvement and expansion, supported by current technologies, and some of them need to be encouraged and widely applied using the best and most advanced technologies. What is required are reliable internet connections; good infrastructure; the understanding and implementation of cyber law; efficient transportation for the delivery of products; trustworthy security systems; fair and effective warranty agreements; the perception of trust, and the promotion of it; comprehensive awareness and training programs; and e-readiness and support from government. This study also identified 'Disablers', which is comprised of 5 factors as follows: fraud and hacking, resistance to change, Telecom charges (cost), tangibility, trial and experience. These factors need to be either managed, limited or prevented in the following ways: finding alternative ways of offering customers a trial or the equivalent of a tangible experience of the product; introducing competitive and affordable charges; promoting the

potential benefits of e-commerce to eliminate the impact of resistance to change; and installing high quality security systems using strong encryption algorithms to prevent hacking and fraud.

### B. Exploratory Study (2) Interviews

In this study, based on the literature and the collected consumers' feedback, the researchers divided the different items (factors) into four main categories that play a significant role in the acceptance or use of m-transactions. These are described below. (1) 'Design and language support', which includes 2 factors: 'usability' and 'Arabic language support', both of which need to be encouraged, improved and widely applied using the best and most advanced technologies. What is required here is that mobile websites are very user-friendly when navigating them; that there are reliable internet and wireless connections, and a very wide coverage for the reception of new mobile technologies (e.g. 3G and 4G); websites should be fully supported by a reasonable range of different mobile devices, and they should fully support the Arabic language, especially for conducting financial transactions. (2) 'User-related Factors', which encompasses two factors: 'trust' and 'awareness'. Trust needs to be fostered and signs need to be used that can encourage more trust (e.g. a trusted third party sign); comprehensive awareness and training programs are required to increase the level of awareness amongst Saudi people. (3) 'Organizational-related Factors' which includes six factors: 'telecommunication infrastructure', 'postal services', 'government e-readiness', 'cyber law', 'telecom charges' (cost), and 'payment gateways'. These require a sophisticated and reliable wireless telecommunication infrastructure, the understanding and implementation of cyber laws, efficient transportation for the delivery of products and e-readiness, and support from government, introducing competitive and affordable charges, and providing a variety of different payment methods. (4) 'System-related Factors', which contains 'security, hacking and fraud', 'usefulness' and 'privacy'. This category requires the installation of high quality, trustworthy security systems that use strong encryption algorithms to prevent hacking and fraud, and therefore increase privacy.

### C. Exploratory Study (3) Focus Group

All the results from the previous studies by the authors [11, 26] were examined in this focus group study. The results that emerged from the discussions in the group were organized into 11 key factors which are: ease of use, visual appeal, navigational structure, ICT infrastructure, usefulness, cost, government m-readiness, social influence, security, trust and culture. Other aspects were mentioned in the discussion, such as: awareness, payment gateway, m-commerce diffusion, etc., but these concepts were considered as insignificant or irrelevant by the participants during the discussion.

### D. Validation Study (1) Questionnaire

The developed framework was empirically validated in a study which involved a statistically representative sample size of more than 1,000 Saudi users from different demographic backgrounds. The empirical analysis revealed that security, ease of use, individualism, masculinity, navigational structure, power distance (strength of social/employment hierarchy),

uncertainty avoidance, usefulness, and website support for mobiles all have a significant impact on consumers' intentions to use m-transactions. Amongst these factors, ease of use was the most influential. This study has been started in 2014 and the authors aim to publish its results as soon as possible. The research results showed that the usability of m-transactions was the most important concern for Saudi users [11, 26, 49]. In particular this study aimed to validate this result by conducting a usability test for m-transactions with Saudi users. The feedback from these tests should help to elucidate the results and shed some light on why usability was ranked higher than other factors.

*E. Validation Study (2) Think-Aloud (Usability test)*

Although the tested application Souq.com [50] enjoys great popularity and represents realistic m-transaction functionalities, the results clearly showed that it was unsatisfactory as a usable application. It has a very low SUS Score (50) compared to 60 which is recommended as an acceptable score. It also ranked in Bangor, Kortum and Miller [51] classification as 'F' which is considered as unacceptable. Furthermore, it has a very low success rate and efficiency. Therefore, the designers and developers of this application have to pay more attention to the usability level of their application and consider the usability problems discovered through the experiments, especially to those categories with a higher number of problems such as 'design/layout', 'completeness', 'correctness' and 'comprehension'. In more detail, the problems and issues that need to be considered are: (1) simplifying the forms (e.g. registration, contact us and add an address); (2) clearly labelling the buttons with names that are easy to understand and reflect the actual function of that button; (3) redesigning the filter function in all sections in a simple way (e.g. so there is no need to press 'apply' for every specification for finding a product); (4) managing the basket needs to be improved (e.g. the product amount does not handle the value of 0 (zero) and the button 'add to the basket' needs to be renamed); (5) adding further functions (e.g. the ability to delete more than one item at a time); (6) correcting errors of logic (e.g. the authors' names were written in two different languages, English and Arabic, the challenge question was written in Arabic yet does not accept the answer while the keyboard is Arabic, and the whole payment confirmation page was written in English while the chosen interface language was Arabic); and (7) removing the distracting popup messages (e.g. after clicking contact us or while looking for a product). A usability test should be conducted prior to the launching of any mobile application to ensure that the usability level is satisfactory. Future research has to pay attention to the importance of usability to consumers' acceptance of IT innovations such as m-transactions.

## V. CONCLUSION

The ultimate product of this research is to develop a consolidated framework for the intention to use m-transactions, combined with a set of recommendations for mobile websites and application developers, designers, government, and organizations which intend to extend their business into the mobile commerce area, and eventually the users. In order to achieve this goal, this study evolved in several stages aiming to reach a satisfactory level of maturity. These stages can be divided into three main phases: three exploratory studies, the first of which (1) shed light on e-commerce as the first generation of m-commerce, while the other two studies focused on m-transactions. These studies helped to add the cultural qualities as a further dimension that would play a significant role in such a unique cultural region. Consequently, a holistic framework is integrated that includes the key factors affecting the intention to use m-transactions. This framework is empirically validated in (2) a further study using a statistically representative sample size of about 1000 Saudi users from different demographic backgrounds. The empirical analysis revealed that security, ease of use, individualism, masculinity, navigational structure, power distance, uncertainty avoidance, usefulness, and website support for mobiles have a significant impact on the intention to use m-transactions. Amongst those factors, ease of use was the most influential for the intention to use m-transaction. Therefore, this lead to (3) another study aimed to empirically investigate the level of ease of use (usability) of conducting m-transaction within the Saudi context. In total, this research went through five different empirical studies to extend our understanding of the phenomenon of m-transaction. Please see Figure 1 below, which summarizes all the different stages of the research.
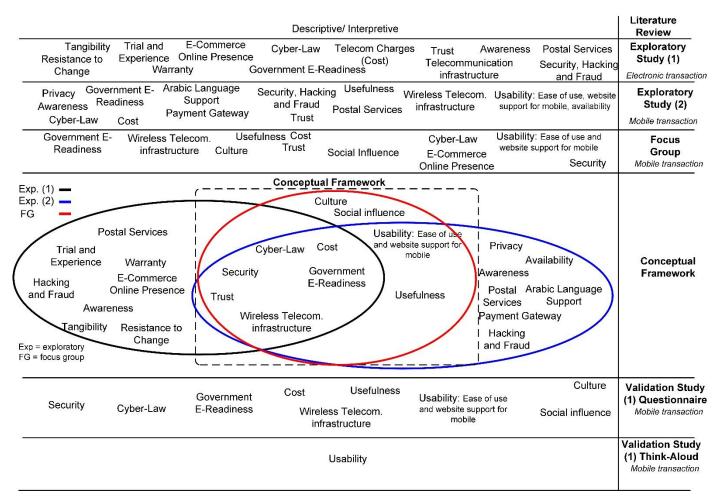
Fig. 1.   A summary of the studies' results and the developed conceptual framework

REFERENCES

[1]   O. Bamasak, 'Exploring consumers acceptance of mobile payments – an empirical study'. *Int J Information Technology, Communications and Convergence,* 1, 173-85, 2011.

[2]   T. Dahlberg, Mallat N., Ondrus J. & Zmijewska A., 'Past, present and future of mobile payments research: A literature review'. *Electronic Commerce Research and Applications,* 7, 165-81, 2008.

[3]   G. Wei, Xinyan Z. & Yue M., 'Literature review on consumer adoption behavior of mobile commerce services'. *E -Business and E -Government (ICEE), 2011 International Conference on,* 1-5, 2011.

[4]   H. Huang, Liu L. & Wang J., 'Diffusion of Mobile Commerce Application in the Market'. *Innovative Computing, Information and Control, 2007 ICICIC '07 Second International Conference on*, 485-, 2007.

[5]   H. Dai & Palvia P. C., 'Mobile Commerce Adoption in China and the United States: A Cross-Cultural Study'. *SIGMIS Database,* 40, 43-61, 2009.

[6]   P. G. Schierz, Schilke O. & Wirtz B. W., 'Understanding consumer acceptance of mobile payment services: An empirical analysis'. *Electronic Commerce Research and Applications,* 9, 209-16, 2010.

[7]   C. Kim, Mirusmonov M. & Lee I., 'An empirical examination of factors influencing the intention to use mobile payment'. *Computers in Human Behavior,* 26, 310-22, 2010.

[8]   Y. A. Au & Kauffman R. J., 'The economics of mobile payments: Understanding stakeholder issues for an emerging financial technology application'. *Electron Commer Rec Appl,* 7, 141-64, 2008.

[9]   Arthur D. Little. Global M-Payment Report 2004. Vienna: 2004.

[10]  Gartner Inc. Gartner Group Dataquest Insight: Mobile Payment, 2007–2012. Stamford, CT: 2009.

[11]  M. Alqahtani, Al-Badi A. & Mayhew P., 'Exploratory Study of M-Transaction: User's Perspectives'. *The Electronic Journal of Information Systems in Developing Countries,* 60, 1-22, 2014.

[12]  Ö. Öztürk & Rızvanoğlu K., M-Commerce usability: an explorative study on turkish private shopping apps and mobile sites. *Design, User Experience, and Usability Web, Mobile, and Product Design.* City: Springer, 2013.

[13]  S. Yang, Lu Y., Gupta S., Cao Y. & Zhang R., 'Mobile payment services adoption across time: An empirical study of the effects of behavioral beliefs, social influences, and personal traits'. *Computers in Human Behavior,* 28, 129-42, 2012.

[14]  K. Petrova & Mehra R., "Mobile Payment: An Exploratory Study of Customer Attitudes". In*:   Wireless and Mobile Communications (ICWMC), 2010 6th International Conference on,* 20-25 Sept. 2010 2010. 378-83, Year.

[15]  G. Walsham, 'The emergence of interpretivism in IS research'. *Information systems research,* 6, 376-94, 1995.

[16]  F. Land, 'The information systems domain'. *Information systems research: issues, methods and practical guidelines*, 6-13, 1992.

[17]  L. Cohen, Manion L. & Morrison K., 'Research Methods in Education [5 th edn] London: Routledge Falmer'. *Teaching in Higher Education,* 41, 2000.

[18]  J. W. Creswell & Clark V. L. P. *Designing and Conducting Mixed Methods Research*, SAGE Publications, 2011.

[19] V. Venkatesh, Brown S. A. & Bala H., 'Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems'. *Mis Quarterly,* 37, 21-54, 2013.

[20] A. Bryman & Bell E. *Business Research Methods*, Oxford University Press, 2007.

[21] C. Hart. *Doing a literature review: Releasing the social science research imagination*, Sage, 1998.

[22] J. Webster & Watson R. T., 'Analyzing the past to prepare for the future: Writing a literature review'. *Management Information Systems Quarterly,* 26, 3, 2002.

[23] Y. Levy & Ellis T. J., 'A systems approach to conduct an effective literature review in support of information systems research'. *Informing Science: International Journal of an Emerging Transdiscipline,* 9, 181-212, 2006.

[24] J. Corbin & Strauss A. *Basics of qualitative research:Techniques and procedures for developing grounded theory, 3rd ed., 3*, Thousand Oaks, Calif. ; London : SAGE Publications., 2008.

[25] C. Marshall & Rossman G. B. *Designing Qualitative Research, 3rd ed.*, Thousand Oaks, Ca., Sage., 1999.

[26] M. Alqahtani, Al-Badi A. & Mayhew P., 'The Enablers and Disablers of E-Commerce: Consumers' Perspectives'. *The Electronic Journal of Information Systems in Developing Countries EJISDC,* 54, 1-24, 2012.

[27] B. J. Calder, 'Focus Groups and the Nature of Qualitative Marketing Research'. *Journal of Marketing Research,* 14, 353-64, 1977.

[28] S. L. Jarvenpaa & Lang K. R., 'Managing the Paradoxes of Mobile Technology'. *Information Systems Management,* 22, 7-23, 2005.

[29] N. Mallat, 'Exploring consumer adoption of mobile payments – A qualitative study'. *The Journal of Strategic Information Systems,* 16, 413-32, 2007.

[30] S. Wilkinson, Focus group research. *In:* Silverman D. (ed.) *Qualitative Research: Theory, Method and Practice.* Second ed. City: SAGE, 2004.

[31] A. Bryman. *Social Research Methods, second ed.,* New York, Oxford University Press, 2004.

[32] P. R. A. Krueger & Casey M. A. *Focus Groups: A Practical Guide for Applied Research,* Thousand Oaks, Sage Publications, 2009.

[33] W. W. Chin, Commentary: Issues and opinion on structural equation modeling. JSTOR, 1998.

[34] H. Wold, 'Soft modelling: the basic design and some extensions'. *Systems under indirect observation, Part II*, 36-7, 1982.

[35] C. M. Ringle, Sarstedt M. & Straub D. W., 'Editor's comments: a critical look at the use of PLS-SEM in MIS quarterly'. *MIS quarterly,* 36, iii-xiv, 2012.

[36] D. Gefen, Rigdon E. E. & Straub D. W., 'Editor's Comment: An Update and Extension to SEM Guidelines for Administrative and Social Science Research'. *MIS Quarterly,* 35, iii-xiv, 2011.

[37] K. A. Bollen. *Structural equation models*, Wiley Online Library, 1998.

[38] W. W. Chin & Newsted P. R., 'Structural equation modeling analysis with small samples using partial least squares'. *Statistical strategies for small sample research,* 1, 307-41, 1999.

[39] C. Fornell & Bookstein F. L., 'Two structural equation models: LISREL and PLS applied to consumer exit-voice theory'. *Journal of Marketing research*, 440-52, 1982.

[40] N. Urbach, Smolnik S. & Riempp G., 'An empirical investigation of employee portal success'. *The Journal of Strategic Information Systems,* 19, 184-206, 2010.

[41] D. Gefen, Straub D. & Boudreau M.-C., 'Structural equation modeling and regression: Guidelines for research practice'. *Communications of the association for information systems,* 4, 7, 2000.

[42] C. M. Ringle, Wende S. & Becker J.-M. 2014. *Smartpls 2.0* [Online]. City: University of Hamburg, Hamburg. Available: http://www.smartpls.com [Accessed 02-10 2014].

[43] J. F. Hair Jr, Hult G. T. M., Ringle C. & Sarstedt M. *A primer on partial least squares structural equation modeling (PLS-SEM)*, SAGE Publications, Incorporated, 2014.

[44] O. Alhadreti, Alroobaea R., Wnuk K. & Mayhew P. J., "The Impact of Usability of Online Library Catalogues on the User Performance". In, 2014 2014. IEEE, 1-4, Year.

[45] M. J. Van Den Haak, De Jong M. D. T. & Schellens P. J., 'Evaluating municipal websites: A methodological comparison of three think-aloud variants'. *Government Information Quarterly,* 26, 193-202, 2009.

[46] R. Benbunan-Fich, 'Using protocol analysis to evaluate the usability of a commercial web site'. *Information & Management,* 39, 151-63, 2001.

[47] A. Bangor, Kortum P. T. & Miller J. T., 'An empirical evaluation of the system usability scale'. *Intl Journal of Human–Computer Interaction,* 24, 574-94, 2008.

[48] J. Brooke, 'SUS-A quick and dirty usability scale'. *Usability evaluation in industry,* 189, 194, 1996.

[49] M. Alqahtani, Alroobaea R. S. & Mayhew P. J., "Building a Conceptual Framework for Mobile Transaction in Saudi Arabia: A User's Perspective". In*:* Science and Information Conference (SAI), 2014 London. 967-73, 2014.

[50] Souq.Com. 2014. *About us* [Online]. City: Saudi.souq.com. Available: http://saudi.souq.com/sa-en/about-us/c/ [Accessed 03/09/2014 2014].

[51] A. Bangor, Kortum P. & Miller J., 'Determining what individual SUS scores mean: Adding an adjective rating scale'. *Journal of usability studies,* 4, 114-23, 2009.