FACTORS INFLUENCING THE CONSUMERS’ ADOPTION OF MOBILE INTERNET

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ABSTRACT

The Internet and mobile technology, the two most dynamic technological forces in modern information and communication technologies are converging into one ubiquitous mobile Internet service, which will change our way of both doing business and dealing with our daily routine activities. There is no doubt that the mobile Internet service is moving toward the new generation on which enables mobile users to enjoy a variety of new and upgraded multimedia mobile services. This research composes a new hybrid theoretical framework to identify the factors affecting the acceptance and use of mobile in a consumer context. The proposed model incorporates eight constructs: performance expectancy, effort expectancy, facilitating conditions, social influences, perceived value, perceived playfulness, attention focus, and behavioral intention. Individual differences—namely, age, gender, and experience—are hypothesized to moderate the effects of behavioral intention towards the use of mobile Internet. Data collected online from respondents in Saudi Arabia were tested against the research model, using the structural equation modeling approach. The proposed model was mostly supported by the empirical data. It was found that performance expectancy and perceived playfulness have the strongest significant effect on the behavioral intentions towards the use of mobile Internet.

KEYWORDS

Mobile Internet, Adoption, Factors, Modeling, ICT Use

1 INTRODUCTION

Information and communications technology or ICT, is often used as an extended synonym for Information Technology (IT), but is a more specific term that stresses the role of unified communications and the integration of telecommunications, computers as well as necessary enterprise software, middleware, storage, and audio-visual systems, which enable users to access, store, transmit, and manipulate information. ICT is an interdisciplinary area of research driven and shaped by the fast development of computing, communication, and Internet-related technologies, which have a great impact on our societies and daily lives. Over the last few decades there has been an increase in ICT research, which has changed and shaped the way societies and organizations operate and produce their goods and services.

Over the last decade the business world has changed so rapidly, that one can no longer imagine managing in a steady state. In no other domain has this observation been more relevant than in the field of ICT. It is not only the generation of new technology but also, and perhaps even to a higher extent, its diffusion throughout the economy which affects productivity growth at the macro-level. It was showed that to capture the benefits of ICT it is not necessary to dispose of an ICT producing sector [1]. Timely diffusion of new technology or,
from the firm’s point of view, its adoption is a key element to securing economic growth.

According to a recent study by on global mobile data traffic forecast, Smartphones represent only 12% of total global handsets in use today, but they represent over 82% of total global handset traffic [2]. Moreover, the number of mobile phone subscriptions reached almost 6,000 million at the end of 2011, representing a penetration rate of 86.7% worldwide and 78.8% in developing countries [3]. Hence, during the period from Sep. 2011 to Sep. 2012, on an average around 265,000 applications were registered in the US App Store [4], and 140,000 application were registered in Android Market during same period [5].

2 LITERATURE REVIEW

In ICT research, numerous theories are used to understand users’ adoption of new technologies. Researchers have attempted to predict and explain user behavior across many IS and IT domains, seeking to investigate and develop theory as to how to improve usage and examine what inhibits usage and intention to use the technology [6]. To develop the conceptual framework for our model it is useful to draw comparisons between the various theories. The theories based on intention of ICT adoption such as Technology Acceptance Model –TAM- [7, 8] and Theory of Planned Behavior –TPB- [9, 10] have shown that the adoption and usage of an IT system is eventually determined by the users’ personal beliefs and attitudes toward the technology. Other models such as IDT state that user’s perception of the characteristics of an innovation is more significant [11].

1.1 Innovation Diffusion Theory (IDT)

Innovation Diffusion Theory (IDT) notes that relative advantage, complexity, compatibility, trialability and observability predict user adoption [12]. Innovation is defined as an idea or practice that is perceived as new by the adopting organization [11]. Braun [13] argued that Rogers Innovation Diffusion Theory (IDT) analyzed the process of diffusion, and mapped the impact of a combination of social, economic, and technical forces on that process. There is a general agreement among researchers that IDT is a suitable and valid theory for examining the process of adoption.

1.2 Theory of Reasoned Action (TRA)

The theory of reasoned action is a widely studied model from social psychology which is concerned with the determinants of consciously intended behaviors [14, 15]. The foundation of the TRA conceptual framework is provided by the distinction between beliefs, attitudes, intentions, and behaviors. The major concern of the conceptual framework, however, is with the relations between these variables.

According to TRA, a person’s performance of a specified behavior is determined by his or her behavioral intention to perform the behavior, and behavioral intention is jointly determined by the person’s attitude and subjective norms concerning the behavior in question.

1.3 Theory of Planned Behavior (TPB)

The theory of planned behavior goes beyond the theory of reasoned action (TRA) and incorporates a further construction, specifically perceived behavior control (PBC); this accounts for those situations where control over the target behavior is not fully volitional [16]. TPB is considered as to be among the more influential of the theories in predicting and explaining behavior [17]. Various studies showed the applicability of TPB to various domains, and verified the ability of this theory in providing a valuable framework to explain and
predict the accepting of new information technology [18].

### 1.4 Technology Acceptance Model (TAM)

Originally introduced by Fred Davis as early as in the 1980s, the Technology Acceptance Model (TAM) sought to measure the willingness of people to accept and adopt new information technology innovations of that era, such as the electronic mail systems [19]. The model had two main determinants which explained IT adoption: Perceived Usefulness and Perceived Ease of Use. In his work, Davis defined them as “the degree to which a person believes that using a particular system would enhance his or her job performance” and “the degree to which a person believes that using a particular system would be free of effort”, respectively [19]. Contrary to his hypothesis, Davis [19] reported that the relationship between perceived usefulness and adoption was significantly stronger than that of between perceived ease of use and adoption. Furthermore, he noted that perceived ease of use might even precede perceived usefulness, suggesting the existence of a causal relationship instead of the independence of the determinants.

### 1.5 Unified Theory of Acceptance and Use of Technology (UTAUT)

UTAUT was developed by Venkatesh [20] to predict user adoption of an information technology. UTAUT integrated eight theories, including the TAM, IDT, the theory of reasoned action (TRA), the motivational model, the theory of planned behavior (TPB), a model combining the TAM and TPB, the model of PC utilization and social cognitive theory (SCT). With empirical analysis, Venkatesh found that performance expectancy; effort expectancy, social influence and facilitating conditions are the main factors determining user adoption [20]. Among them, performance expectancy is similar to perceived usefulness and relative advantage. Effort expectancy is similar to perceived ease of use and complexity. Social influence is similar to subjective norm. Since its inception, UTAUT has been used to explain user adoption of a variety of information technologies, including location-based services [21], mobile technologies [22], mobile banking [23], and Internet banking [24], and health information technologies [25].

### 3 RESEARCH MODEL

Due to the relatively low adoption rate of ICT, this research has paid much attention to prior work [20, 26, 27] when identifying the factors affecting mobile user behavior.

**Performance Expectancy** reflects the perceived utility associated with using mobile Internet. Mobile Internet frees users from temporal and spatial limitations, and enables them to acquire information or services at anytime from anywhere. This can improve users’ living and working performance and efficiency.

**Effort Expectancy** reflects the perceived difficulty of using mobile Internet. The constraints of mobile terminals such as small screens and inconvenient input have made it relatively difficult for users to search for information on mobile Internet [28].

**Social Influence** reflects the effect of referees’ opinion on individual user behavior [27]. According to social influence theory, users tend to comply with other important referees’ opinions [29]. Thus when others who are important to a user recommend him or her to use mobile Internet, he or she may follow their suggestions.

**Facilitating Conditions** mean that users have the resources and knowledge necessary to use mobile Internet. Users need to bear the costs of using mobile Internet, such as communication fees and service fees.
**Perceived Value** is defined as the consumer’s overall assessment of the utility of a product based on perceptions of what is received and what is given [30].

**Perceived Playfulness** reflects the pleasure and enjoyment associated with using technology. Perceived enjoyment is an intrinsic motivation that emphasizes the usage process, whereas perceived usefulness is an extrinsic motivation that emphasizes the outcome [31]. In addition, perceived enjoyment may also facilitate continuance usage.

**Attention Focus** reflects a user’s immersion when using ICT such as mobile Internet. Mobile users often perform multiple tasks on movement, such as listening to music and accessing mobile Internet. Thus their attention allocated to mobile Internet may be limited. If they cannot focus their attention, their experience may be affected [27].

**Behavioral Intention** is defined as a person’s perceived likelihood or subjective probability that he or she will engage in a given behavior. With increasing experience, consumers have more opportunities to reinforce their habit because they have more time to encounter the cues and perform the associated behavior [32].

Figure 1 presents the research model including the eight constructs and the behavioral intentions to accept and use the mobile Internet as well as gender, age, education, experience and income as moderating variables.
4 RELIABILITY AND VALIDITY ANALYSIS

To analyze the internal consistency of the constructs, the Cronbach’s α was calculated and tested its reliability. The model reliability coefficient is 0.86, which exceeded the recommended 0.7 cut-off value. Therefore, all constructs in this study demonstrated acceptable reliability. A confirmatory factor analysis was conducted to check the statistical validity of the constructs. As shown in Table 2, all AVE values are greater than 0.5, which indicates that the model had convergent validity. The square-root values of AVE were greater than the correlations between the corresponding constructs and the confidence intervals of the coefficients did not include 1.0, which indicated that the constructs had discriminant validity.

Table 1 Descriptive information of the sample

<table>
<thead>
<tr>
<th>Option</th>
<th>Count</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>207</td>
<td>87.0</td>
</tr>
<tr>
<td>Female</td>
<td>31</td>
<td>13.0</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under 20</td>
<td>22</td>
<td>9.2</td>
</tr>
<tr>
<td>20 - 29</td>
<td>158</td>
<td>66.4</td>
</tr>
<tr>
<td>30 - 39</td>
<td>40</td>
<td>16.8</td>
</tr>
<tr>
<td>40 - 49</td>
<td>16</td>
<td>6.7</td>
</tr>
<tr>
<td>50 and above</td>
<td>2</td>
<td>.8</td>
</tr>
<tr>
<td>Education</td>
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<td></td>
</tr>
<tr>
<td>Less than High School</td>
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<td>1.3</td>
</tr>
<tr>
<td>High School</td>
<td>64</td>
<td>26.9</td>
</tr>
<tr>
<td>Some College/ Diploma</td>
<td>20</td>
<td>8.4</td>
</tr>
<tr>
<td>Bachelor Degree</td>
<td>127</td>
<td>53.4</td>
</tr>
<tr>
<td>Master Degree and Higher</td>
<td>24</td>
<td>10.1</td>
</tr>
<tr>
<td>Income (Saudi Riyals)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 1000</td>
<td>95</td>
<td>39.9</td>
</tr>
<tr>
<td>1000 - 4000</td>
<td>62</td>
<td>26.1</td>
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<tr>
<td>4001 - 8000</td>
<td>24</td>
<td>10.1</td>
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<tr>
<td>8001 - 14000</td>
<td>37</td>
<td>15.5</td>
</tr>
<tr>
<td>14001 - 20,000</td>
<td>9</td>
<td>3.8</td>
</tr>
<tr>
<td>More than 20,000</td>
<td>10</td>
<td>4.2</td>
</tr>
<tr>
<td>Internet Experience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 1 year</td>
<td>34</td>
<td>14.3</td>
</tr>
<tr>
<td>1-2 years</td>
<td>61</td>
<td>25.6</td>
</tr>
<tr>
<td>3-5 years</td>
<td>79</td>
<td>33.2</td>
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</table>

Table 2 Confirmatory factor analysis results

<table>
<thead>
<tr>
<th>Construct</th>
<th>Measure</th>
<th>Estimate</th>
<th>S.E.</th>
<th>C.R.</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention Focus</td>
<td>AF1</td>
<td>.843</td>
<td>.096</td>
<td>8.759</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>AF2</td>
<td>1.287</td>
<td>.148</td>
<td>8.699</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>AF3</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavioral Intention</td>
<td>BI1</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BI2</td>
<td>1.384</td>
<td>.110</td>
<td>12.628</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>BI3</td>
<td>1.408</td>
<td>.101</td>
<td>13.971</td>
<td>0.01</td>
</tr>
<tr>
<td>Effort Expectancy</td>
<td>EE1</td>
<td>.888</td>
<td>.086</td>
<td>10.276</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>EE2</td>
<td>1.154</td>
<td>.097</td>
<td>11.936</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>EE3</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EE4</td>
<td>1.134</td>
<td>.094</td>
<td>12.104</td>
<td>0.01</td>
</tr>
<tr>
<td>Facilitating Conditions</td>
<td>FC1</td>
<td>1.523</td>
<td>.282</td>
<td>5.398</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>FC2</td>
<td>1.292</td>
<td>.237</td>
<td>5.449</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>FC3</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FC4</td>
<td>1.104</td>
<td>.217</td>
<td>5.088</td>
<td>0.01</td>
</tr>
<tr>
<td>Performance Expectancy</td>
<td>PE1</td>
<td>.752</td>
<td>.070</td>
<td>10.726</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>PE2</td>
<td>.873</td>
<td>.076</td>
<td>11.516</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>PE3</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Playfulness</td>
<td>PP1</td>
<td>1.088</td>
<td>.062</td>
<td>17.643</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>PP2</td>
<td>1.031</td>
<td>.050</td>
<td>20.417</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>PP3</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Value</td>
<td>PV1</td>
<td>.989</td>
<td>.089</td>
<td>11.089</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>PV2</td>
<td>.864</td>
<td>.081</td>
<td>10.660</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>PV3</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Influence</td>
<td>SI1</td>
<td>.879</td>
<td>.206</td>
<td>4.264</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>SI2</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5 REGRESSION ANALYSIS

Using structural equation modeling, the hypothesized relationships in the proposed research model were tested and analyzed. As seen in Table 3, the results showed that the χ² value of 469.99 (d.f. = 247) with a p-value of .001 indicated a good model fit. In addition, fit indices such as the Normalized Fit Index (NFI = 0.87), Non-Normed Fit Index level of 0.9, indicating a good model fit. Furthermore, it was suggested that if the Root Mean Square Error of Approximation (RMSEA = 0.062) is less than 0.08, this represents a reasonable error of approximation [33].

The Root Mean Square Residual (RMR) in this study was equal to 0.054, which is below 0.08; hence, it is regarded as evidence of good fit [34]. In summary, the overall results suggested that the research model offered an adequate fit to the data.

We next examined the estimated coefficients of the causal relationships between constructs that validated the hypothesized effects. Figure 2 illustrates the estimated coefficients and their significance in the structural model. (NNFI = 0.91), Comparative Fit Index (CFI = 0.93) and Incremental Fit Index (IFI = 0.93) almost all exceeded the suggested

<table>
<thead>
<tr>
<th>Fit indices</th>
<th>Recommended value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-square/degrees freedom (χ²/df)</td>
<td>&lt;5.00 [43]</td>
<td>1.903</td>
</tr>
<tr>
<td>Root Mean Square Error of</td>
<td>&lt;0.08 [43]</td>
<td>0.062</td>
</tr>
<tr>
<td>Approximation (RMSEA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Root Mean Square Residual (RMR)</td>
<td>&lt;0.08 [43]</td>
<td>0.054</td>
</tr>
<tr>
<td>Normed fit index (NFI)</td>
<td>&gt;0.90 [45]</td>
<td>0.87</td>
</tr>
<tr>
<td>Non-Normed Fit Index (NNFI)</td>
<td>&gt;0.90 [43]</td>
<td>0.91</td>
</tr>
<tr>
<td>Comparative Fit Index (CFI)</td>
<td>&gt;0.90 [45]</td>
<td>0.93</td>
</tr>
<tr>
<td>Incremental Fit Index (IFI)</td>
<td>&gt;0.90 [45]</td>
<td>0.93</td>
</tr>
</tbody>
</table>

6 SUMMARY OF THE MAIN FINDINGS

This study analyzed the influence of 8 proposed constructs with moderated variables on the adoption and use of ICT in Saudi Arabia. Performance expectancy (t-value = 5.96) and perceived playfulness (t-value = 5.87) have shown the highest significant impact on the consumers’ behavioral intentions towards using the mobile Internet services in Saudi Arabia. Satisfaction affects continuance usage. Numerous studies have uncovered that satisfaction is a main factor determining continuance behavior [35, 36]. Among the factors affecting satisfaction, perceived playfulness has the largest effect. Thus mobile services providers should deliver an enjoyable experience to enhance user satisfaction.

Surprisingly, both perceived value and effort expectancy have shown a non-significant impact on the consumers’ behavioral intentions towards the use of mobile Internet with t-values of 1.12, and 0.58 respectively. Similarly, the moderating variable of individual characteristics (i.e., different combinations of age, gender, and experience) found to be statistically insignificant with a t-value of 1.01. Those insignificant values tend to be a natural result of the respondents’ profiles, which might skewed or changed when applying the model in a different geographical region.

Facilitating conditions, social influences, and attention focus were significantly influence the behavioral intentions towards the ICT use with t-values of 2.87, 3.88, and 2.00 respectively. This suggests that mobile service providers may use word-of-mouth effect to facilitate user behavior. Facilitating conditions reflect that users have the knowledge and resources necessary to use mobile Internet. It is quite likely that as facilitating conditions deals with broader infrastructure and support issues, it will always be important to those who value it even if they have significant experience with the target technology.
Behavioral intention in the consumer context had a positive and strong direct effect on the use of ICT with a very high $t$-value of 9.14 and explained variance ($R^2$) of 28%. Consumers’ behavioral intention toward adoption and use of ICT is also be affected by other factors such as the opinions of other important persons (social influence) [15]. Furthermore, even if users have a strong intention to perform a behavior, they will not be able to do so without the necessary resources and skills (facilitating conditions) [37]. Hence, previously confirmed effects of other constructs naturalize this result as well.

7 LIMITATIONS

This section examines limitations of the current study and considers the impact they have on the research conclusions. There are a number of intrinsic limitations related to a research study of this nature. First, in cultural studies, the use of self-reported data is often confused with a number of biases such as social-desirability bias. In some situations, respondents may be tempted to give the socially desirable response rather than describe what they actually think, believe or do [38]. A second limitation might be the respondents’ profile; they were mainly young people whose behavior might differ somewhat from the population average. They are generally more innovative and faster to accept new technologies, and this may have biased to the results.

A third limitation might be the sampling method employed in this research. It can be claimed that the representative character of the respondents relative to the entire population could be increased [39, 40]. Another limitation in this research is perhaps the use of cross-sectional research design in a fast-moving and developing IT field. Cross-sectional designs may be attractive for their advantages of saving on time and cost, however the design strictly limits the researcher’s capability to address changing or developmental issues or recommend fundamental interpretations [41, 42]. Finally, a further issue relating to the sample such as different technology, educational level, different age group, economic statutes, and different region, may have played a role in each individual respondent’s answer. Recognizing these limitations, some of the results should be perhaps regarded as more suggestive than conclusive.

REFERENCES


