

## **Understanding Mobile Data Services' Continuance: The Role of Enjoyment and Media Richness**

**Chien-Wen Chen**

*Department of Business Administration,  
Feng Chia University, Taiwan*

**Serhan Demirci\***

*College of Business, Ph.D. Program in Business,  
Feng Chia University, Taiwan*

---

### **Abstract**

High popularization and the development of communication technology for mobile phones resulted in a diversity of mobile data services in Taiwan, thus turning mobile data services into important profit sources for telecommunication companies. There are various constraints affecting continued usage of mobile data services, such as a decrease in profits due to low profit margins and a limited population of users, and understanding factors like perceived media richness and perceived cost on such usage behavior of consumers is crucial for the future of mobile data services. Examining consumers with mobile data service experiences, this research finds that the major factor impacting mobile data service usage for customers is perceived usefulness, followed by perceived media richness and perceived enjoyment. The results suggest that telecommunication companies should consider prioritizing usefulness when designing their service content so that satisfied consumers will increase continued usage intention for mobile data services. We also find that perceived media richness is the major factor influencing both perceived usefulness and perceived enjoyment. Based on these findings, we suggest that increasing the cognition of perceived media richness can be a top strategy for telecommunication companies to raise continued usage intention for mobile data services, such as an enrichment of service contents or providing information through live images/messages.

*Key words:* mobile data service; IS continuance model; perceived media richness; perceived cost.

*JEL classifications:* L86; M10; M31

---

Received December 25, 2018, revised June 11, 2019, accepted July 11, 2019.

\*Correspondence to: Ph.D. Program in Business, Feng Chia University, Taiwan, 100, Wenhwa Rd., Seatwen, Taichung 40724, Taiwan. E-mail: p0041497@fcu.edu.tw.

## **1. Introduction**

Following the emergence of mobile devices like smartphones and tablets, mobile data services (MDS) have become significantly important (Lee et al., 2009). In the U.S. the four big MDS providers, Verizon Wireless, AT&T, T-Mobile, and Sprint, constitute 90% of the mobile data market (NetworkWorld, 2016). The market for mobile services has grown rapidly with revenues of US\$41.1 billion in 2015 that are expected to hit US\$101 billion by 2020 (Statista, 2016). At the end of 2016, 4.8 billion people worldwide had a mobile subscription, and this is expected to reach 5.7 billion by 2020 (GSMA Intelligence Report, 2017). The mobile industry contributed US\$3.3 trillion, which corresponds to 4.4% of GDP globally. These statistics have encouraged telecommunication companies to invest in the development of new services and to elevate the efficacy of mobile data services (MDS), leading to increasing numbers of users. Over the last decade, mobile operators have invested more than US\$1 trillion across the globe. Most of these investments are driven by the need to build and increase technical infrastructure (Boakye, 2015).

Mobile data services are defined as an assortment of ICT services that can be accessed using a mobile device over a wide range of geographic area (Kim et al., 2009). They include various services from online banking, to gaming, messaging, social networking, and other informational services such as maps and news that are accessed via mobile devices (Hong & Tam 2006). These services are accessed through various applications (Boudreau, 2012). Mobile data services have become very popular in the last couple of years, replacing voice services as the growth engine for the mobile telecommunications industry (Lee et al., 2009). Traditional mobile services such as voice and text have reached market saturation, and mobile operators now face harsh price wars (Al-Debei & Al-Lozi, 2014). Therefore, mobile operators are leaning on mobile data service subscriptions as a means to increase revenue (EMR, 2015).

Despite the rapid growth in the MDS industry and popularization of mobile devices, telecommunications operators face an increasing challenge from the rising competitive pressure in the marketplace (Boakye, 2015). The low rate of average revenues per user is another issue, as revenue growth for mobile operators is projected to slow down due to increasing competition (GSMA Intelligence Report, 2014). To have a competitive advantage, mobile service providers have turned to creating long-term relationships with their customers to retain them. Hong et al. (2008) mention that the key step for the survival of telecommunications companies is to increase continued usage of MDS. Mobile operators are in need of understanding consumer decision making for acquiring and retaining mobile data service users (Hau et al., 2012). Previous research shows that the cost is five times greater to acquire new customers compared to retaining them (Chen & Myagmarsuren, 2011). Therefore, this study intends to examine factors influencing customers' continuance intention of using mobile data services.

Although the importance of continued usage within MDS is evident, the factors influencing such usage and models for investigating it remains unclear. Previous researchers have elaborated upon continuance intention within MDS from different perspectives. Kim et al. (2009) investigate continued usage by integrating the

technology acceptance model (TAM), perceived fee, experience, and perceived enjoyment and suggest that perceived enjoyment influences continued usage positively. However, perceived fee appears to have a negative influence on continued usage. More recent research on perceived fee also shows a similar result. (Ahmed & Sathish, 2016; Ojiaku & Osarenkhoe, 2018). Kuo et al. (2009) integrate service quality and perceived value in exploring continued usage, with findings suggesting that perceived value influences both customer satisfaction and continued usage positively. Similarly, service quality factors such as interactivity, customization, responsiveness, and usefulness have a significant impact on satisfaction among Taiwanese MDS users (Lee & Chen, 2014). One study on mobile health services in Ghana notes that service quality dimensions significant affect continuance intention (Oppong et al., 2018). Investigating online banking application users, Saeed (2018) presents that ubiquitous access to mobile data services and being able to manage tasks associated with various life domains also have significant effects on continuance intention. Similarly, service quality influences trust and satisfaction and subsequently loyalty (Ofori, Boakye & Narteh, 2018). Research on second-generation mobile instant messaging also supports that satisfaction contributes to continuance intention (Gong et al., 2018).

The IS Continuance Model proposed by Bhattacharjee et al (2001) widely appears in information systems and continued usage research. The three dimensions included in this model are confirmation, perceived usefulness, and satisfaction. Our study extends the IS Continuance Model by adding the variables of perceived enjoyment and perceived media richness. Previous research on MDS also suggests that it is necessary to integrate perceived enjoyment into the IS Continuance Model (Al-Adwan et al., 2018; Hong et al., 2006a; Hong & Tam, 2006; Thong et al., 2006; Kim et al., 2007a, 2007b; Kim et al., 2009; Kang et al., 2009). With the development of mobile technologies and the availability of rich media content within MDS, perceived media richness from the Media Richness Theory (MRT) can also be another integrated factor. Media richness denotes the ability of a medium to carry information (Trevino et al., 1987). Mobile data services enable fast and efficient transfer of data, allowing users to benefit from high-speed communication in various forms of media. However, research on how media richness affects MDS continuance intention is scant. For example, investigating customer loyalty in mobile instant messaging, Tseng et al. (2017) find media richness positively affects customer loyalty. Finally, drawing upon previous research that suggests cost is an important factor in continuance intention (Chong, 2013; Lin et al., 2012; Zhou, 2011), our study also explores perceived cost. We believe the research findings will serve as a reference for telecommunications companies to develop future promotion strategies.

The remainder of this study is organized as follows. Section 2 includes a review of MDS and IS Continuance Model and their extension with the media richness theory. Section 3 details the hypothesis development. Section 4 introduces the method for examining the proposed model. Finally, we present research results, discussion, and implications.

## **2. Literature Review**

### **2.1 Continued Usage Behavior and the IS Continuance Model**

Research on continued usage behavior dates back to the 1970s with several models exploring this behavior. Among them, the expectation confirmation theory (ECT) of Oliver (1980) is the most accepted model for studying continued usage behavior. Several researchers have applied and modified the ECT model (Dabholkar et al., 2000; Patterson, 1997; Swan, 1980; Tse, 1988). Although this model is widely accepted, there are some limitations. Thus, Bhattacharjee (2001) proposes the IS Continuance Model as an alternative to ECT with the purpose of studying continued usage behavior in information systems. The three dimensions in this model are confirmation, perceived usefulness, and satisfaction.

#### **2.1.1 Perceived Usefulness**

Perceived usefulness defines the “extent to which individuals believe that using a particular IT will enhance their job performance” (Bhattacharjee & Lin, 2015). When systems are perceived as being useful, users are more likely to have positive intentions regarding IS usage. Various studies (Boakye, 2015; Hong et al., 2006a; Hong and Tam, 2006; Kim et al., 2007b; Thong et al., 2006; Kim et al., 2006) reveal that perceived usefulness significantly affects continued usage intention in MDS, because the users believe that MDS provides beneficial service functions. Thus, perceived usefulness plays an important role in MDS research.

#### **2.1.2 Confirmation**

Confirmation is the extent to which the actual use experience confirms one’s initial expectation. Research shows that confirmation positively correlates to satisfaction (Bhattacharjee, 2001; Thong et al., 2006; Venkatesh et al., 2011) and is classified into three types: negative-disconfirmation, confirmation, and positive-disconfirmation. Negative-disconfirmation means that the product or service is under the customer’s expectation and results in dissatisfaction. On the other hand, confirmation and positive-disconfirmation of expectation lead to satisfaction with the product or service. When the users’ experience matches or exceeds the initial expectation, confirmation leads to user satisfaction, because the expected benefits of IS use are realized. In contrast, if the actual use experience falls below the initial expectation, then dissatisfaction takes place, because it fails to achieve the expectation. Many research reports confirm that expectation significantly influences the continued usage behavior (Oghuma et al., 2016; Chen et al., 2016; Zhang et al., 2015; Alraimi et al., 2015; Hsu & Lin, 2015). Similarly, the difference in expectation and confirmation can significantly influence the satisfaction of IS usage (Bhattacharjee, 2001; Thong et al., 2006).

### **2.1.3 Satisfaction**

Satisfaction denotes “an end-user’s overall affective and cognitive evaluation of their fulfilment” when using an information system (Bhattacharjee, 2001). It is a result of the level of expectations matching, exceeding, or falling short of product or service performance. Users have a tendency to rely more on their satisfaction than on relatively unknown future expectations (Bhattacharjee & Lin, 2015). Several papers (Choi et al., 2008; Kuo et al., 2009) mention that satisfaction plays an important role in continued usage of MDS. A higher level of satisfaction leads to a higher level of continued usage intention. Therefore, satisfaction is dominant in evaluating continued usage intention of MDS.

### **2.1.4 Continuance Intention**

Continuance intention has a central role in evaluating the success of information systems and is essential for the survival of enterprises (Parthasarathy & Bhattacharjee, 1998; Crego & Schiffrin 1995; Reichheld & Sasser, 1990; Bhattacharjee, 2001). Continuance intention is associated with satisfaction and other perceived factors, such as perceived usefulness and perceived enjoyment. For the investigation of continuance intention of MDS, it is necessary to integrate other perceived factors, such as perceived enjoyment, media richness, and perceived cost (Thong et al., 2006; Limayem & Cheung, 2008; Kang et al., 2009). In the following section, we describe these additional factors.

The literature validates the IS Continuance Model in different contexts. They cover mobile payment (Zhou, 2013), electronic medical records (Ayanso et al., 2015), knowledge sharing in virtual environments (Zheng et al., 2013), and continuous use of ERP systems (Chou & Chen, 2009; Khosravi et al., 2012).

## **2.2 The Extension of the IS Continuance Model**

Research related to the continuance intention of MDS requires extending the original IS Continuance Intention Model by adding perceived factors (Limayem & Cheung, 2008; Kang et al., 2009; Thong et al., 2006). Lee (2010) looks to integrate ECM with the Technology Acceptance Model (TAM), based on the notion that there are similarities between the constructs of ECM and TAM. For example, both ECM and TAM include perceived usefulness as a form of belief towards IT usage. In addition, several papers (Hong et al., 2006a; Hong and Tam, 2006; Kim et al., 2007a, 2007b; Kang et al., 2009; Kim et al., 2009) point out that including perceived factors like perceived enjoyment can significantly influence continuance intention for MDS. Thus, this study also takes into consideration the effect of perceived enjoyment on the continuance intention of MDS.

### **2.2.1 Perceived Enjoyment**

Perceived enjoyment refers to the level of enjoyment an individual perceives during the use of IS. The IS literature presents that intrinsic motivations such as

enjoyment, fun, and entertainment significantly influence customer intention to use novel systems and applications (Davis et al., 1992; Thong et al., 2006; Venkatesh & Thong, 2012). Previous research has shown that mobile Internet can bring enjoyment to users (Alalwan et al., 2017; Chong, 2013; Park et al., 2014). Thong et al. (2006) point out that the experience over continuance intention of MDS helps renew perceived enjoyment of IS. This means that perceived enjoyment positively correlates with both users' satisfaction and continuance intention. Thus, integration of perceived enjoyment into the IS Continuance Intention Model positively explains the continuance intention of MDS.

### **2.2.2 Perceived Media Richness**

Research on perceived media richness starts with Daft & Lengel (1984) who offer the media richness theory as an extension of the information processing theory. According to the media richness theory, each communication channel has a set of characteristics that determine its capability to carry information. These characteristics are ranked and evaluated based on the richness of media (Daft & Lengel, 1986).

Many fields employ the media richness theory. For example, Liu et al. (2009) merge the theory with the flow theory and TAM to examine the acceptance of e-learning technology. Li et al. (2012) find that media richness is an important factor affecting customers' decision making in mobile shopping. Several papers examine the relationship between perceived media richness and continuance intention for IS. Lee et al. (2007) reveal that the level of media richness is proportional to the level of continuance intention in customers using multimedia messages. Lu et al. (2014) shows that rich media content incites more trust, thus leading to increased purchasing intention. Examining mobile instant messaging applications, Tseng et al. (2017) find that perceived media richness positively relates to customer loyalty.

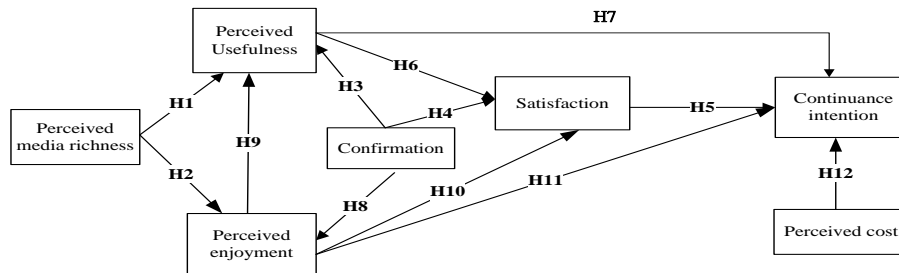
### **2.2.3 Perceived Cost**

Perceived cost refers to monetary and non-monetary sacrifices, like time, effort, and consumers' willingness to pay at maintaining an ongoing relationship with a service provider (Parasuraman & Grewal, 2000; Sirdeshmukh et al., 2002). Perceived cost is a significant variable in MDS continuance intention (Kim et al., 2009; Kim et al., 2010; Wu and Wang, 2005; Zhou, 2013). Previous research on MDS continuance intention shows that perceived cost has a significant effect on both satisfaction and continuance intention (Dhaha & Ali, 2014; Kim, 2010). Similarly, Kumar & Reddy (2014) present that perceived cost is the most important factor for adopt MDS in India.

## **3. Research Method**

There are seven factors utilized in this study: perceived media richness, perceived usefulness, perceived enjoyment, perceived cost, confirmation, satisfaction, and continuance intention. Figure 1 illustrates the structure of the study.

Figure 1. Research Structure and Hypotheses



### 3.1 The Relationships Among Perceived Media Richness, Perceived Usefulness, and Perceived Enjoyment

Tseng et al. (2017) find that media richness positively relates to customer perceived values, which further positively relate to customer loyalty in mobile instant messaging. Customer perceived values denote a customer's overall assessment of the utility of a product or service that includes different dimensions such as functional, social, and self-expressive values. Therefore, rich media content leads to higher levels of perceived value, perceived usefulness, and enjoyment. Anandarajan et al. (2010) also express that media richness relates to perceived social usefulness and use richness, which in turn underline customer perception of usefulness. Finally, Lee et al. (2007) state that perceived media richness increases users' perceived usefulness and perceived enjoyment, thus promoting their understanding and demands for the multimedia message. Therefore, we present the following two hypotheses.

H1: Perceived media richness influences perceived usefulness positively.

H2: Perceived media richness influences perceived enjoyment positively.

### 3.2 The Relationships among Perceived Usefulness, Confirmation Level, and Continuance Intention

Bhattacharjee (2001) mentions that the satisfaction of IS depends on the level of confirmation and perceived usefulness, leading to influence continuance intention. Bahattcherjee (2001), Thong et al. (2006), Limayem & Cheung (2008) and Kim et al. (2009) also state that perceived usefulness shows a positive correlation with satisfaction and continuance intention. Examining mobile technology within companies, Kim (2008) finds that perceived usefulness has a significant impact on acceptance intention. Chung & Kwon (2009) conduct research on the acceptance of mobile banking services and show that perceived usefulness and perceived ease of use significantly predict continuance intention. Analyzing factors predicting university students' actual online usage of a mobile learning management system, (Joo et al., 2016) conclude that perceived usefulness and satisfaction predict continuance

intention. Therefore, we arrive at the next three hypotheses.

H3: Confirmation influences perceived usefulness positively.

H4: Confirmation influences satisfaction positively.

H5: Satisfaction influences continuance intention positively.

H6: Perceived usefulness influences satisfaction positively.

H7: Perceived usefulness influences continuance intention positively.

### **3.3 The Relationships among Perceived Enjoyment, Perceived Usefulness, Confirmation, Satisfaction, and Continuance Intention**

Several papers report that both perceived enjoyment and perceived usefulness significantly influence MDS continuance intention (Hong & Tam, 2006; Hong et al., 2006a; Lee et al., 2007; Kim et al., 2009). In addition, perceived enjoyment plays significant and positive roles in influencing users' satisfaction and usefulness for MDS (Thong et al., 2006; Hong & Tam, 2006). Previous studies also indicate that perceived enjoyment is an important factor when it comes to students' intentions to use mobile learning systems (Cheng, 2014; Jung, 2014; Al-Adwan et al., 2018). Therefore, we present the next hypotheses.

H8: Confirmation influences perceived enjoyment positively.

H9: Perceived enjoyment influences perceived usefulness positively.

H10: Perceived enjoyment influences satisfaction positively.

H11: Perceived enjoyment influences continuance intention positively.

### **3.4 The Relationship between Perceived Cost and Continuance Intention**

Perceived cost plays a key role for customers in getting IS (Liao & Cheung, 2001). Various research shows a significant relationship between perceived cost and continuance intention (Wang & Lin, 2012; Agarwal et al. 2007; Kim et al., 2009; Kim et al. 2010; Zhou, 2013). Kim (2010) finds that perceived fee significantly affects Korean students' intention to continue to use mobile data services. In addition, data from Hong et al. (2008) and Kim et al. (2009) reveal that perceived cost influences MDS continuance intention negatively. Agarwal et al. (2007) and Kumar & Reddy (2014) also show that perceived cost has a negative significant effect on mobile service adoption. Therefore, we hypothesized the following.

H12: Perceived cost influences continuance intention negatively.

### **3.5 Survey Instrument and Measurement**

This study utilizes a web-based questionnaire to gather data. After the literature review, we identified and modified measurement items to make them relevant to MDS continuance intention. The questionnaire consists of items measuring perceived media richness (Lee et al., 2007), perceived cost (Cronin et al., 2000; Kim et al., 2008; Kuo & Yen, 2009; Luarn & Lin, 2005; Wu & Wang, 2005), perceived usefulness (Davis, 1989; Thong et al., 2006; Kim et al., 2008; Kim et al., 2009; Parthasarathy & Bhattacharjee, 1998; Wang et al., 2006; Wu & Wang, 2005), perceived enjoyment (Davis et al., 1992; Hong & Tam, 2006; Thong et al., 2006; Kim et al., 2009),



continuance intention (Bhattacharjee, 2001; Lin et al., 2005; Thong et al., 2006; Kim et al., 2009), confirmation (Bhattacharjee, 2001; Lin et al., 2005; Thong et al., 2006), and satisfaction (Spreng & Olshavsky, 1993; Spreng et al., 1996; Bhattacharjee, 2001; Lin et al., 2005; Thong et al., 2006).

#### **4. Analysis of Results**

##### **4.1 Data Collection**

A web-based questionnaire was sent to respondents with actual experience in MDS, and 285 valid questionnaires were collected for further analysis. The demographics of the valid respondents are as follows: male consumers are 71.23%, and female consumers are 28.77%. From the collected questionnaires, we find that the frequencies of 1~3 days/week and below 1 day/week cover 41.05% and 32.98% of MDS users, respectively. Total time usage of below 10 mins/week and 10~30 mins/week matches 39.65% and 27.37% of MDS users, respectively, while usage durations of below 5 mins/time and 10~30 mins/time come from 45.61% and 27.02% of MDS users, respectively.

For mobile communication service, mobile enjoyment service, mobile information service, and mobile business service, the percentages of users are 63.51%, 17.19%, 14.39% and 4.91%, respectively. The data clearly suggest that mobile communication service is the most popular function for MDS users. In addition, the percentages of users for text message, multimedia message, image phone, GPS positioning, games, ring-tone downloading, email, life/travel information, and weather report are 24.64%, 10.59%, 8.92%, 7.69%, 6.80%, 7.02%, 6.35%, 5.69%, and 5.69%, respectively. This means that text message is the most popular service for MDS users. This study also investigates monthly charges for using MDS. We find that the percentages of users paying NT\$50~100/month and below NT\$50/month are 30.18% and 27.02%, respectively. This result reveals that most users pay NT\$50~100/month when using MDS services.

**Table 1. Demographics (Number of Subjects = 285)**

| Measure                 | Item                                  | Frequency | Percentage (%) |
|-------------------------|---------------------------------------|-----------|----------------|
| Gender                  | Male                                  | 203       | 71.23          |
|                         | Female                                | 82        | 28.77          |
| Age                     | Under 18                              | 7         | 2.46           |
|                         | 19-25                                 | 178       | 62.46          |
|                         | 26-35                                 | 84        | 29.47          |
|                         | 36-45                                 | 13        | 4.56           |
|                         | Over 45                               | 3         | 1.05           |
| Education               | Junior high school or less            | 1         | 0.35           |
|                         | High school                           | 12        | 4.21           |
|                         | University                            | 175       | 61.40          |
|                         | Graduate school                       | 97        | 34.04          |
| Occupation              | Full-time student                     | 178       | 62.46          |
|                         | Military, public service, education   | 24        | 8.42           |
|                         | Finance                               | 3         | 1.10           |
|                         | Media/Culture                         | 1         | 0.35           |
|                         | Freelancer                            | 8         | 2.81           |
|                         | Service industry                      | 25        | 8.77           |
|                         | Manufacturing                         | 12        | 4.21           |
|                         | Specialist (doctor, lawyer, engineer) | 9         | 3.16           |
|                         | Information industry                  | 14        | 4.91           |
|                         | Communication industry                | 4         | 1.40           |
|                         | Other                                 | 7         | 2.46           |
| Monthly MDS Expenditure | Less than NT\$100                     | 163       | 57.20          |
|                         | NT\$101~300                           | 48        | 16.84          |
|                         | NT\$301~500                           | 37        | 12.98          |
|                         | NT\$501~800                           | 21        | 7.37           |
|                         | NT\$801~1000                          | 14        | 4.91           |
|                         | Over NT\$1000                         | 2         | 0.70           |

#### 4.2 Analysis of Measurement Model

The questionnaire items are based on our literature review, and thus the content of questionnaires shows validity. In addition, we use confirmatory factor analysis (CFA) for confirming the representativeness of each question. Table 2 summarizes the construct definitions and measurement scales. Furthermore, multiple R square and Chi-square degrees of freedom are applied for deleting or modifying the evaluation items, leading to increasing levels of GFI and AGFI. We use Cronbach's Alpha for examining the reliability of every dimension, as shown in Table 3. We find that the reliability for this study ranges from 0.860 to 0.937, all higher than 0.7. This means that the study shows excellent reliability (Hair et al., 2010). Most individual item reliabilities above 0.5. All of the composite reliabilities are higher than 0.8. All of the average variance extracted values are higher than 0.5. The data denote that all markers (Table 3) are located in excellent ranges (Hair et al., 2010).

Table 2. Summary of Measurement Scales

| Constructs and citations                                                                                                                                                                          | Construct definitions and items                                                                                 | Factor loadings |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------|
| <b>Perceived Media Richness</b> (source: Lee et al., 2007)                                                                                                                                        | User's perception of the mobile data services' ability to deliver rich information                              |                 |
| PMR1                                                                                                                                                                                              | MDS can provide immediate feedback                                                                              | 0.647           |
| PMR2                                                                                                                                                                                              | MDS can provide rich and diverse information                                                                    | 0.763           |
| PMR3                                                                                                                                                                                              | MDS can provide the right information based on my situation.                                                    | 0.828           |
| PMR4                                                                                                                                                                                              | MDS can deliver multiple types of information content                                                           | 0.882           |
| <b>Perceived Usefulness</b><br>(sources: Davis (1989), Thong et al. (2006), Kim et al. (2008), Kim et al. (2009), Parthasarathy and Bhattacharjee (1998), Wang et al. (2006), Wu and Wang (2005)) | Users' belief that the use of mobile data services increases their personal interests                           |                 |
| PU1                                                                                                                                                                                               | MDS is helpful for my daily life                                                                                | 0.754           |
| PU2                                                                                                                                                                                               | Using MDS helps me accomplish things more quickly                                                               | 0.902           |
| PU3                                                                                                                                                                                               | Using MDS increases my productivity                                                                             | 0.775           |
| PU4                                                                                                                                                                                               | Overall, using MDS is useful                                                                                    | 0.745           |
| <b>Perceived Enjoyment</b><br>(sources: Davis et al. (1992), Hong and Tam (2006), Thong et al. (2006), Kim et al. (2009))                                                                         | Users' enjoyment perceived through the use of mobile data services                                              |                 |
| PE1                                                                                                                                                                                               | Using MDS is fun                                                                                                | 0.887           |
| PE2                                                                                                                                                                                               | I think using mobile internet services is enjoyable                                                             | 0.861           |
| PE3                                                                                                                                                                                               | I enjoy using MDS                                                                                               | 0.823           |
| PE4                                                                                                                                                                                               | Overall, the services provided by MDS are interesting                                                           | 0.881           |
| <b>Perceived Cost</b><br>(sources: Cronin et al. (2000), Kim et al. (2008), Kuo and Yen (2009), Luarn and Lin (2005), Wu and Wang (2005))                                                         | The monetary cost that users are willing to pay to use mobile data services                                     |                 |
| PC1                                                                                                                                                                                               | I think equipment cost of using MDS is expensive                                                                | 0.775           |
| PC2                                                                                                                                                                                               | I think connection cost of using MDS is expensive                                                               | 0.916           |
| PC3                                                                                                                                                                                               | I think transmission cost of using MDS is expensive                                                             | 0.906           |
| PC4                                                                                                                                                                                               | I think cost of using MDS is expensive                                                                          | 0.933           |
| PC5                                                                                                                                                                                               | For me, the current MDS tariff is too high                                                                      | 0.740           |
| <b>Confirmation</b><br>(sources: Bhattacharjee (2001b), Lin et al. (2005), Thong et al. (2006))                                                                                                   | The degree to which users' expectations of the mobile data service are consistent with their actual performance |                 |
| CONF1                                                                                                                                                                                             | My experience after using MDS was better than what I expected                                                   | 0.657           |
| CONF2                                                                                                                                                                                             | The service level provided by MDS was better than what I expected                                               | 0.772           |
| CONF3                                                                                                                                                                                             | The MDS provided by the telecom company is better than what I expected                                          | 0.922           |
| CONF4                                                                                                                                                                                             | Overall, most of my expectations from using MDS were confirmed                                                  | 0.840           |
| <b>Satisfaction</b><br>(sources: Spreng and Olshavsky (1993), Spreng et al. (1996), Bhattacharjee (2001b), Lin et al. (2005), Thong et al. (2006))                                                | The degree of users' positive emotional state resulting from use of mobile data services                        |                 |
| SAT1                                                                                                                                                                                              | Using MDS makes me feel satisfied                                                                               | 0.877           |
| SAT2                                                                                                                                                                                              | I like to use MDS                                                                                               | 0.840           |
| SAT3                                                                                                                                                                                              | I feel very satisfied with the experience of using MDS                                                          | 0.829           |
| SAT4                                                                                                                                                                                              | I think the decision to use MDS is wise                                                                         | 0.787           |
| SAT5                                                                                                                                                                                              | In general, I am satisfied with the MDS provided by the telecom company.                                        | 0.777           |
| <b>Continuance Intention</b><br>(sources: Spreng and Olshavsky (1993), Spreng et al. (1996), Bhattacharjee (2001b), Lin et al. (2005), Thong et al. (2006))                                       | The degree of users' intention to continue to use mobile data services                                          |                 |
| CI1                                                                                                                                                                                               | In the future, I plan to continue to use MDS                                                                    | 0.927           |
| CI2                                                                                                                                                                                               | In my daily life, I always try to use MDS                                                                       | 0.843           |
| CI3                                                                                                                                                                                               | I will keep using MDS as regularly as I do now                                                                  | 0.887           |
| CI4                                                                                                                                                                                               | I intend to increase my use of MDS in the future                                                                | 0.697           |

Table 3. Correlations and AVE

|      | Cronbach's $\alpha$ | AVE   | CR    | PMR          | PC           | CONF         | PU           | PE           | SAT          | CI           |
|------|---------------------|-------|-------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| PMR  | 0.860               | 0.616 | 0.864 | <b>0.785</b> |              |              |              |              |              |              |
| PC   | 0.930               | 0.736 | 0.933 | 0.495        | <b>0.858</b> |              |              |              |              |              |
| CONF | 0.872               | 0.646 | 0.878 | 0.084        | 0.093        | <b>0.804</b> |              |              |              |              |
| PU   | 0.872               | 0.634 | 0.873 | 0.630        | 0.478        | 0.026        | <b>0.796</b> |              |              |              |
| PE   | 0.937               | 0.789 | 0.937 | 0.613        | 0.478        | 0.130        | 0.584        | <b>0.888</b> |              |              |
| SAT  | 0.912               | 0.677 | 0.913 | 0.651        | 0.608        | 0.073        | 0.668        | 0.614        | <b>0.823</b> |              |
| CI   | 0.904               | 0.711 | 0.907 | 0.599        | 0.525        | 0.01         | 0.630        | 0.633        | 0.708        | <b>0.843</b> |

\* AVE = average variance extracted. CR = composition reliability.

\*\* Diagonal elements in the 'correlation of constructs' matrix are the square root of the average variance extracted. PMR = perceived media richness; PC = perceived cost; CONF = confirmation; PU = perceived usefulness; PE = perceived enjoyment; SAT = satisfaction; CI = continuance intention.

Several fit indicators in Table 4 are evaluated to assess how well the model fits the data. The results show that model fit is good: the ratio of chi-square statistics to the degrees of freedom (df), the standardized root mean squared residual (SRMR), and root mean square error of approximation (RMSEA) are less than the recommended values, while goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), normed fit index (NFI), incremental fit index (IFI), and non-normed fit index (NNFI) are greater than the suggested threshold. According to the above test outcomes, all indices meet the requirements as suggested by Bagozzi & Yi (1988).

Table 4. Measures of the Model Fit

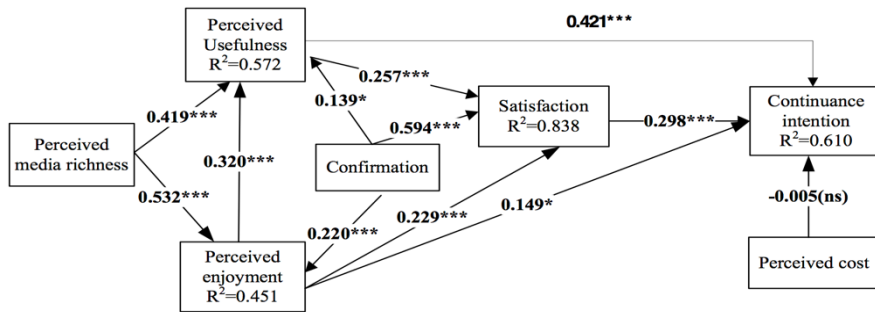
| Fit indices                                     | Criteria | Measurement model | Structural model |
|-------------------------------------------------|----------|-------------------|------------------|
| $\chi^2/df$                                     | <3       | 1.035             | 1.705            |
| Goodness of fit index (GFI)                     | >0.9     | 0.902             | 0.901            |
| Adjusted for degrees of freedom (AGFI)          | >0.8     | 0.894             | 0.870            |
| Normed fit index (NFI)                          | >0.9     | 0.928             | 0.933            |
| Non-normed fit index (NNFI)                     | >0.9     | 0.996             | 0.965            |
| Incremental fit index (IFI)                     | >0.9     | 0.997             | 0.971            |
| Comparative fit index (CFI)                     | >0.9     | 0.997             | 0.971            |
| Standardized root mean squared residual (SRMR)  | < 0.05   | 0.038             | 0.040            |
| Root mean square error of approximation (RMSEA) | <0.08    | 0.017             | 0.050            |

### 4.3 Validity Analysis

The fitness measures of the structure model also indicate a good level of fit (see Table 4). Figure 2 and Table 5 present the results of the structural model analysis. These results show that all hypotheses are supported, except H12. Furthermore, the results also indicate that the model explains 57.2% of the variance in perceived usefulness, 45.1% in perceived enjoyment, 83.8% in satisfaction, and 61.0% in continuance intention. These results mean that the explanation from the dependent variable to independent variable is excellent. Our results demonstrate that media enjoyment and usefulness are major factors for users consuming MDS services. The connection between usefulness and enjoyment is getting stronger, especially in post-

adoption. This means that the continuance intention for MDS user is decreasing if the services from telecommunication company do not meet users' expectations. We suggest that increasing user satisfaction can help raise continuance intention via the enhancement of services such as usefulness and enjoyment. Furthermore, service of media-richness is also an important factor for a telecommunications company in increasing continuance intention for MDS users.

Figure 2. Results of the Hypothesis Test (\*\*\*) P<0.001, \*\* P<0.01, \* P<0.05)



In this study we also find that perceived cost does not influence continuance intention, and this finding is consistent with previous studies (Hsu et al., 2008; Teng et al., 2009). That is because more resources for MDS users lead to minimizing the effect of cost. Thus, price competition is not a good strategy for maintaining continuance intention of MDS users. On the other hand, the development of novel information systems or services is the best strategy for increasing user satisfaction, which leads to greater company profits.

Table 5. Tests of Hypothesized Relationships

| Hypothesis                                          | Relationship | Coefficient | t value  | Result      |
|-----------------------------------------------------|--------------|-------------|----------|-------------|
| H1: Perceived media richness → Perceived usefulness | +            | 0.419       | 5.399*** | support     |
| H2: Perceived media richness → Perceived enjoyment  | +            | 0.532       | 7.762*** | Support     |
| H3: Confirmation → Perceived usefulness             | +            | 0.139       | 2.199*   | support     |
| H4: Confirmation → Satisfaction                     | +            | 0.594       | 9.909*** | support     |
| H5: Satisfaction → Continuance intention            | +            | 0.298       | 3.734*** | Support     |
| H6: Perceived usefulness → Satisfaction             | +            | 0.257       | 4.340*** | Support     |
| H7: Perceived usefulness → Continuance intention    | +            | 0.421       | 5.232*** | Support     |
| H8: Confirmation → Perceived enjoyment              | +            | 0.220       | 3.488*** | Support     |
| H9: Perceived enjoyment → Perceived usefulness      | +            | 0.320       | 4.438*** | Support     |
| H10: Perceived enjoyment → Satisfaction             | +            | 0.229       | 4.130*** | Support     |
| H11: Perceived enjoyment → Continuance intention    | +            | 0.149       | 2.187*   | Support     |
| H12: Perceived cost → Continuance intention         | -            | -0.005      | 0.920    | Not support |

Note: \*\*\* P<0.001, \*\* P<0.01, \* P<0.05.

### 5. Discussion and Implications

This present research extends our understanding of MDS continuance intention by integrating perceived variables into the IS Continuance Model of Bhattacherjee

(2001), adopting the Expectation-Confirmation Theory, IS Continuance Model, and Media Richness Theory as our theoretical basis. We evaluate the effects of usability, perceived enjoyment, and perceived cost on the relationship between MDS satisfaction and continuance intention. Our proposed model explains a significant variance in satisfaction (83.81%) and continuance intention (61.00%). Our results underline the importance of perceived usefulness, perceived enjoyment, and perceived media richness as major factors in affecting the continuance of MDS. We summarize our finding in the following sections.

### **5.1 Theoretical Implications**

This study contributes to the literature by extending our understanding of the impact of enjoyment, media richness, and usefulness on customers' continuance intention regarding MDS. First, we confirm that extending the IS Continuance Model (Bhattacharjee, 2001) with the integration of other perceived factors like enjoyment or cost could further explain the continuance intention for MDS users (Limayem & Cheung, 2008; Thong et al., 2006; Hong et al., 2006). Our findings support the notion that user perceptions can help understand IT usage behavior in general and MDS continuance behavior in particular. When it comes to continued use of mobile data services, users' perception of various factors is crucial, and an extended model is required to analyze the importance of these additional factors. Our research considers enjoyment, media richness, and cost, and the results show that such an extended analysis is valid.

Second, the results herein confirm that perceived usefulness, confirmation, and post-adoption satisfaction influence continuance intention significantly for MDS users. When users believe MDS provides useful services, they will have the intention to continue using MDS. These findings parallel previous research on the IS Continuance Model (Bhattacharjee, 2001) and prove that the proposed model is suitable for exploring continuance intention for MDS users. By definition, MDS is a long-term commitment for users and charged monthly for a few years of subscription. The level of satisfaction with the service and whether the expectations are met or not are significantly important for continuance intention and renewal of subscription.

Third, Lee et al. (2007) mention that perceived media richness influences perceived usefulness and perceived enjoyment in their study associated with multimedia message. In our study we confirm that perceived media richness influences perceived usefulness and perceived enjoyment significantly. This finding reveals that MDS users expect MDS to provide rich and enjoyable content. Rich media enable better communication (Hsu et al., 2008), which is a main characteristic of MDS use. Users expect to have useful, rich content with their mobile service, thus leading to higher levels of perceived usefulness and enjoyment. Mobile data services are not only limited with text messaging, but also include many applications such as image and video sharing, video communication, and other Internet-based services that provide a wide range and amount of rich media content for users.

Fourth, our study shows that confirmation influences perceived usefulness, perceived enjoyment, and satisfaction positively and also positively influences

continuance intention indirectly. This means that MDS products or services should fulfill users' expectations. If the expectations are not fulfilled, then the evaluation of MDS services will be low, thus decreasing the continuance intention for users in using MDS services. Especially in regards to mobile data, meeting user expectations may have different challenges for telecommunications companies. Service area coverage might be a significant factor, as users in different geographic locations might get subpar service due to location-specific constraints. Srivastava & Kaul (2014) underline during the past decade that MDS customers have become more enlightened and demanding, making it more challenging to meet their expectations.

Perceived usefulness, perceived enjoyment, and confirmation as expected influence satisfaction positively. Moreover, perceived media richness also influences satisfaction positively. If MDS products or services satisfy users' expectation, then they will evaluate the products or services positively. Therefore, telecommunications companies should improve the usefulness, enjoyment, and richness of MDS services or products in order to satisfy users' expectation. This will help to increase continuance intention for MDS users.

Finally, we find that perceived cost does not influence continuance intention significantly. However, cost issues are always major factors for users when consuming products or services. In a highly competitive saturated market like mobile data, price competition is inevitable (Boakye, 2015). MDS users do not need to pay a premium to reach high quality services. Thus, users do not perceive cost as a major issue affecting their intention. This might be an explanation for why perceived cost does not influence continuance intention significantly.

## **5.2 Practical Implications**

The research results show that perceived usefulness influences both satisfaction and continuance intention positively. In addition, perceived usefulness also influences confirmation positively. This proves that usefulness plays a central role in continuance intention for MDS users. Improvement of usefulness for MDS services (such as communications, real-time message, online meetings, or e-mail) can satisfy users' needs, leading to an increase of continuance intention. Therefore, we suggest that telecommunications companies should continually update the usefulness of MDS services. The confirmation of MDS services' usefulness can elevate users' satisfaction, leading to higher continuance intention.

In addition to perceived usefulness, perceived enjoyment influences perceived usefulness, satisfaction, and continuance intention positively. This finding means that enjoyment is one of the main purposes for users in using MDS services. Thus, we suggest that telecommunications companies pay attention to improving the enjoyment of MDS services and find creative ways to enrich enjoyment services (such as interactive games or friend searching). This could increase the level of enjoyment and result in greater continuance intention. Perceived media richness is also an important factor associated with both perceived usefulness and perceived enjoyment. Thus, we suggest that telecommunications companies increase the quantity of information and increase the displayed function of information. Users perceive detailed information

offered as helpful, such as instant real-time reports for transportation, news, travel spots, food spots, and movie introductions.

Free trials for users in using MDS services should be considered as a promotion strategy. We know that confirmation plays an important role in continuance intention. The expectation for pre-adoption mainly comes from other people or commercials. Thus, the experiences from free trials may help users to confirm the expectation between pre-adoption and post-adoption. We suggest that telecommunications companies offer free trials as a commercial strategy in order to let users further understand and experience MDS services.

Finally, our results show that perceived cost does not influence continuance intention. This means that price battles as commercial strategies do not help telecommunication companies increase continuance intention. We suggest that these companies should focus on the improvement of service quality or information communication quality and not service price. This should increase users' perceived factors, leading to an increase of continuance intention toward MDS.

### **5.3 Research Limitations and Future Suggestions**

Despite the findings of this research, the results of this study should be interpreted in light of its limitations. First, the delivery and collection of questionnaires were mainly achieved by using the Internet. Although the Internet offers several advantages such as low cost, high interaction, quick, and no space limitation, not all people have broad experience at using the Internet. Students and organizational employees are heavy Internet users. Thus, the population of interviewees may be narrow. Second, MDS may vary due to the generation of the mobile numbers or mobile functions. In addition, some mobile or phone numbers may be restricted to MDS, resulting in low-level usage for certain MDS. Finally, in our research cost refers to financial cost or price of MDS. However, research on adopting or switching to a new service shows that cost may have sub-dimensions (Tseng & Teng, 2014). For example, Burnham et al. (2003) identify three switching costs: procedural switching cost that involves the expenditure of time and effort, financial switching cost that involves the loss of financially quantifiable resources, and relational switching cost that involves psychological or emotional discomfort due to the loss of identity and the breaking of bonds.

Future studies should first include interviewees with people of different ages or occupations, as students were the main interviewees herein. Researchers could cooperate with telecommunications companies to broaden the sample size. Second, in addition to MDS, other subjects may be considered in a future study, such as hot service items (mobile positioning, mobile TV, or 4G), telecommunications industrial dynamics, technology (WiMAX), or smartphones (iPhone). Finally, some perceived factors were integrated into the IS Continuance Model by this study. We suggest that other factors can be considered to be integrated into a future study, such as perceived value, social influence (Hong et al., 2008), prior experience (Kim et al., 2009), and perceived risk (Wu and Wang, 2005) in order to increase the explanation of the model's application. Future research can apply multiple sub-dimensions of perceived



switching costs such as procedural, financial, and relational costs. This may offer more practical assistance or suggestions to telecommunications company.

## References

- Ahmed, K. A. A. and A. S. Sathish, (2016), "Examining the Factors that Affect 3G Mobile Data Service Continuance Intention among Young Indian (IT) Working Professionals," *Global Management Review*, 10(3), 26-41.
- Alalwan, A. A., Y. K. Dwivedi, and N. P. Rana, (2017), "Factors influencing adoption of mobile banking by Jordanian bank customers: extending UTAUT2 with trust," *International Journal of Information Management*, 37(3), 99-110.
- Al-Adwan, A. S., A. Al-Madadha, and Z. Zvirzdinaite, (2018), "Modeling Students' Readiness to Adopt Mobile Learning in Higher Education: An Empirical Study," *The International Review of Research in Open and Distributed Learning*, 19(1), 221-241.
- Al-Debei, M. M. and E. Al-Lozi, (2014), "Explaining and predicting the adoption intention of mobile data services: A value-based approach," *Computers in Human Behaviour*, 35(1), 326-338.
- Alraimi, K. M., H. Zo, and A. P. Ciganek, (2015), "Understanding the MOOCs continuance: The role of openness and reputation," *Computers & Education*, 80, 28-38.
- Anandarajan, M., M. Zaman, Q. Dai, and B. Arinze, (2010), "Generation Y adoption of instant messaging: An examination of the impact of social usefulness and media richness on use richness," *IEEE Transactions on Professional Communication*, 53(2), 132-143.
- Bagozzi, R. P., and Y. Yi, (1988), "On the evaluation of structural equation models," *Journal of the Academy of Marketing Science*, 16(1), 74-94.
- Bhattacharjee, A., (2001), "Understanding Information Systems Continuance: An Expectation-confirmation Model," *MIS Quarterly*, 25(3), 351-370.
- Bhattacharjee, A. and C. P. Lin, (2015), "A unified model of IT continuance: three complementary perspectives and crossover effects," *European Journal of Information Systems*, 24(4), 364-373.
- Boakye, K. G., (2015), "Factors influencing mobile data service (MDS) continuance intention: An empirical study," *Computers in Human Behavior*, 50, 125-131.
- Boudreau, K. J., (2012), "Let a thousand flowers bloom? An early look at large numbers of software app developers and patterns of innovation," *Organization Science*, 23(5), 1409-1427.
- Burnham, T. A., J. K. Frels, and V. Mahajan, (2003), "Consumer switching costs: a typology, antecedents, and consequences," *Journal of the Academy of Marketing Science*, 31(2), 109-126.
- Chen, C. F. and O. Myagmarsuren, (2011), "Brand equity, relationship quality, relationship value, and customer loyalty: Evidence from the telecommunications services," *Total Quality Management & Business Excellence*, 22(9), 957-974.
- Chen, C. W., P. H. Yu, and Y. J. Li, (2016), "Understanding Group-Buying Websites

- Continuous Use Behavior: A Use and Gratifications Theory Perspective,” *Journal of Economics and Management*, 12(2), 177-204.
- Cheng, Y., (2014), “Exploring the intention to use mobile learning: the moderating role of personal innovativeness,” *Journal of Systems and Information Technology*, 16(1), 40-61.
- Chong, A. Y. L., (2013), “Predicting m-commerce adoption determinants: A neural network approach,” *Expert Systems with Applications*, 40(2), 523-530.
- Chung, N. and S. J. Kwon, (2009), “The effects of customers’ mobile experience and technical support on the intention to use mobile banking,” *Cyber Psychology & Behavior*, 12 (5), 539–543.
- Clarke, I., (2001), “Emerging Value Proposition for M-Commerce,” *Journal of Business Strategies*, 18(2), 133-148.
- Cooper, R. B. and R. W. Zmud, (1990), “Information Technology Implementation Research: A Technological Diffusion Approach,” *Management Science*, 36(2), 123-139.
- Crego Jr., E. T. and P. D. Schiffrin, (1995), *Customer-Centered Reengineering: Remapping for Total Customer Value*, Irwin, Burr Ridge, IL.
- Cronin Jr., J. J., M. K. Brady, and G. T. Hult, (2000), “Assessing the Effects of Quality, Value, and Customer Satisfaction on Consumer Behavioral Intentions in Service Environments,” *Journal of Retailing*, 76 (2), 193–218.
- Daft, R. L. and R. H. Lengel, (1984), “Information Richness: A New Approach to Managerial Behavior and Organization Design,” *Research in Organizational Behavior*, 6, 191-233.
- Daft, R. L. and R. H. Lengel, (1986), “Organizational information requirements, media richness and structural design,” *Management Science*, 32(5), 554-571.
- Davis, F. D., (1989), “Perceived Usefulness, Perceived Ease of Use, and End User Acceptance of Information Technology,” *MIS Quarterly*, 13(3), 319-340.
- Davis, F. D., R. P. Bagozzi, and P. D. Warshaw, (1992), “Extrinsic and Intrinsic Motivational to Use Computers in Workplace,” *Journal of Applied Social Psychology*, 22(14), 1111-1132.
- Dhaha, I. S. Y. A. and A. Y. S. Ali, (2014), “Mediating Effects Of Behavioral Intention Between 3G Predictors And Service Satisfaction,” *Malaysian Journal of Communication Jilid*, 30, 107-128
- Ericsson Mobility Report, (EMR), (2015), Mobile business trends, <http://www.ericsson.com>.
- Fazio, R. H. and M. P. Zanna, (1981), “Direct Experience and Attitude-Behavior Consistency,” in *Advances in Experimental Social Psychology*, 6, (Berkowitz, L. eds.) Academic Press, New York, 161-202.
- Gong, X., M. K. Lee, Z. Liu, and X. Zheng, (2018), “Examining the role of tie strength in users’ continuance intention of second-generation mobile instant messaging services,” *Information Systems Frontiers*, 1-22.
- GSMA Intelligence Report, (2014), The mobile economy 2014, [http://www.gsmamobileeconomy.com/GSMA\\_ME\\_Report\\_2014\\_R2\\_WEB.pdf](http://www.gsmamobileeconomy.com/GSMA_ME_Report_2014_R2_WEB.pdf).
- Hair, J. F., B. Black, B. Babin, and R. E. Anderson, (2010), *Multivariate data analysis:*

*a global perspective*, 7th edition, Prentice Hall.

- Hau, Y. S., G. Kim and B. Kim, (2012), "Antecedents of user satisfaction in the context of mobile data services: The moderating role of variety and rate of usage," *International Journal of Mobile Communications*, 10(6), 617–636.
- Hong, S. J., J. Y. L. Thong, Y. L. Moon, and K. Y. Tam, (2008), "Understanding the Behavior of Mobile Data Services Consumers," *Information System Frontiers*, 10(4), 431-445.
- Hong, S. J. and K. Y. Tam, (2006), "Understanding the Adoption of Multipurpose Information Appliances: The Case of Mobile Data Services," *Information Systems Research*, 17(2), 162–179.
- Hong, S. J., K. Y. Tam, and J. Kim, (2006a), "Mobile Data Service Fuels the Desire for Uniqueness," *Communications of the ACM*, 49(9), 89-95.
- Hong, S. J., J. Y. L. Thong, J. Y. Moon, and K. Y. Tam, (2008), "Understanding the behavior of mobile data services consumers," *Information Systems Frontiers*, 10(4), 431–445.
- Hsu, C. L. and J. C. C. Lin, (2015), "What drives purchase intention for paid mobile apps?—An expectation confirmation model with perceived value," *Electronic Commerce Research and Applications*, 14(1), 46-57.
- Hsu, H. H., H. P. Lu and C. L. Hsu, (2008), "Multimedia Messaging Service Acceptance of Pre- and Post-adopters: A Sociotechnical Perspective," *International Journal of Mobile Communications*, 6(5), 599-615.
- Joo, Y., N. K. U. E. Kim, and N. Kim, (2016), "Factors predicting online university students' use of a mobile learning management system (m-LMS)," *Educational Technology Research & Development*, 64(4), 611-630.
- Jung, H., (2014), "Ubiquitous learning: determinants impacting learners' satisfaction and performance with smartphones," *Language learning & technology*, 18(3), 97-119.
- Kang, Y. S., S. Hong and H. Lee, (2009), "Exploring Continued Online Service Usage Behavior: The Roles of Self-Image Congruity and Regret," *Computers in Human Behavior*, 25, 111-122.
- Kankanhalli, A., H. J. Ye, and H. H. Teo, (2015), "Comparing Potential and Actual Innovators: An Empirical Study of Mobile Data Services Innovation," *MIS Quarterly*, 39(3), 667-682.
- Karahanna, E., D. W. Straub, and N. L. Chervany, (1999), "Information Technology Adoption across Time: A Cross-Sectional Comparison of Pre-Adoption and Post-Adoption Belief," *MIS Quarterly*, 23(2), 183-213.
- Katz, J. Z., (2008), *Handbook of Mobile Communication Studies*, MA: MIT Press.
- Kim, S. H., (2008), "Moderating effects of job relevance and experience on mobile wireless technology acceptance: Adoption of a smartphone by individuals," *Information & Management*, 45(6), 387–393.
- Kim, B., (2010), "An empirical investigation of mobile data service continuance: Incorporating the theory of planned behavior into the expectation–confirmation model," *Expert Systems with Applications*, 37(10), 7033- 7039.
- Kim, H., I. Lee, and J. Kim, (2008), "Maintaining Continuers vs. Converting

- Discontinuers: Relative Importance of Post-Adoption Factors for Mobile Data Services,” *International Journal of Mobile Communications*, 6(1), 108-132.
- Kim, B., M. Choi, and I. Han, (2009), “User Behaviors toward Mobile Data Services: The Role of Perceived Fee and Prior Experience,” *Expert Systems with Applications*, 36(4), 8528–8536.
- Kim, H. W., H. C. Chen, and S. Gupta, (2007a), “Value-Based Adoption of Mobile Internet: An Empirical Investigation,” *Decision Support System*, 43(1), 111-126.
- Kim, H. W., H. C. Chan, and Y. P. Chan, (2007b), “A Balance Thinking-Feeling Model of Information Systems Continuance,” *International Journal of Human-Computer Studies*, 65(6), 511-525.
- Kim, H. W., K. Y. Kwahk and H. Y. Lee, (2010), “An integrated model of mobile internet services usage and continuance,” *International Journal of Mobile Communications*, 8(4), 411-429.
- Kuo, Y. F. and S. N. Yen, (2009), “Towards an Understanding of the Behavioral Intention to Use 3G Mobile Value-Added Services,” *Computers in Human Behavior*, 25, 103-110.
- Kuo, Y. F., C. M. Wu, and W. J. Deng, (2009), “The Relationships among Service Quality, Perceived Value, Customer Satisfaction, and Post-Purchase Intention in Mobile Value-Added Services,” *Computers in Human Behavior*, 25(4), 887–896.
- Kumar, D. P. and K. R. H. Reddy, (2014), “A Study on Adoption Levels of 3G Services in Andhra Pradesh,” *Asian Journal of Research in Business Economics and Management*, 4(4), 1-13.
- Lee, H. M. and T. Chen, (2014), “Perceived quality as a key antecedent in continuance intention on mobile commerce,” *International Journal of Electronic Commerce Studies*, 5(2), 123.
- Lee, M. C., (2010), “Explaining and predicting users’ continuance intention toward e-learning: An extension of the expectation-confirmation model,” *Computers & Education*, 54 (2), 506-516.
- Lee, M. K. O., C. M. K. Cheung, and Z. Chen, (2007), “Understanding User Acceptance of Multimedia Messaging Services: An Empirical Study,” *Journal of the American Society for Information Science and Technology*, 58(13), 2066–2077.
- Lee, S., B. Shin, and H. G. Lee, (2009), “Understanding Post-adoption Usage of Mobile Data Services: The Role of Supplier-side Variables,” *Journal of the Association for Information Systems*, 10(12), 860-888.
- Li, M., Z. Y. Dong, and X. Chen, (2012), “Factors influencing consumption experience of mobile commerce: a study from experiential view,” *Internet Research*, 22(2), 120-141.
- Liao, Z. and M. T. Cheung, (2001), “Internet-Based E-Shopping and Consumer Attitudes: An Empirical Study,” *Information and Management*, 38(5), 299-306.
- Lin, C. S., S. Wu, and R.J. Tsai, (2005), “Integrating Perceived Playfulness into Expectation-Confirmation Model for Web Portal Context,” *Information and Management*, 42, 683-693.
- Lin, T. C., S. Wu, J. S. C. Hsu, and Y. C. Chou, (2012), “The integration of value-

- based adoption and expectation–confirmation models: An example of IPTV continuance intention,” *Decision Support Systems*, 54(1), 63-75.
- Limayem, M. and C. M. K. Cheung, (2008), “Understanding Information Systems Continuance: The Case of Internet-Based Learning Technology,” *Information and Management*, 45, 227-232.
- Liu, S. H., H. L. Liao, and J. A. Pratt, (2009), “Impact of media richness and flow on e-learning technology acceptance,” *Computers & Education*, 52(3), 599-607.
- Lu, J., C. Liu, C. S. Yu, and K. Wang, (2008), “Determinants of accepting wireless mobile data services in China,” *Information & Management*, 45(1), 52-64.
- Lu, Y., Y. Kim, X. Y. Dou, and S. Kumar, (2014), “Promote physical activity among college students: Using media richness and interactivity in web design,” *Computers in Human Behavior*, 41, 40-50.
- Luarn, P. and H. H. Lin, (2005), “Towards an Understanding of the Behavioral Intention to Use Mobile Banking,” *Computers in Human Behavior*, 21(6), 873-891.
- Network World, (2016), “The votes are in: Which mobile data provider is best?,” <https://www.networkworld.com/article/3040445/the-votes-are-in-which-mobile-data-provider-is-best.html>.
- Ofori, K. S., K. Boakye, and B. Narteh, (2018), “Factors influencing consumer loyalty towards 3G mobile data service providers: evidence from Ghana,” *Total Quality Management & Business Excellence*, 29(5-6), 580-598.
- Oghuma, A. P., C. F. Libaque-Saenz, S. F. Wong, and Y. Chang, (2016), “An expectation-confirmation model of continuance intention to use mobile instant messaging,” *Telematics and Informatics*, 33(1), 34-47.
- Ojiaku, O. C. and A. Osarenkhoe, (2018), “Determinants of Customers’ Brand Choice and Continuance Intentions with Mobile Data Service Provider: The Role of Past Experience,” *Global Business Review*, 19(6), 1478-1493.
- Oliver, R. L., (1980), “A Cognitive Model of the Antecedents and Consequences of Satisfaction Decisions,” *Journal of Marketing Research*, 17(4), 460-469.
- Oliver, R. L., (1997), *Satisfaction: A Behavioral Perspective on the Consumer*, Irwin/McGraw-Hill.
- Oppong, E., R. E. Hinson, O. Adeola, O. Muritala, and J. P. Kosiba, (2018). The effect of mobile health service quality on user satisfaction and continual usage. *Total Quality Management & Business Excellence*, 1-22.
- Palmer, J. W., (2002), “Web Site Usability, Design, and Performance Metrics,” *Information Systems Research*, 13(2), 151-167.
- Park, E., S. Baek, J. Ohm, and H. J. Chang, (2014), “Determinants of player acceptance of mobile social network games: An application of extended technology acceptance model,” *Telematics and Informatics*, 31(1), 3-15.
- Parthasarathy, M. and A. Bhattacharjee, (1998), “Understanding Post-Adoption Behavior in the Context of Online Services,” *Information Systems Research*, 9(4), 362-379.
- Parasuraman, A. and D. Grewal, (2000), “The Impact of Technology on the Quality–Value–Loyalty Chain: A Research Agenda,” *Journal of the Academy of*

- Marketing Science*, 28(1), 168–174.
- Reichheld, F. F. and W. E. Sasser Jr., (1990), “Zero Defections: Quality Comes to Services,” *Harvard Business Review*, 68(5), 105–111.
- Rogers, E. M., (1995), *Diffusion of Innovations*, 4th Edition, New York Free Press.
- Saeed, K. A., (2018). “Mobile Services as a Means to Control: An Empirical Assessment,” *Journal of Computer Information Systems*, 1–11.
- Sirdeshmukh, D., J. Singh, and B. Sabol, (2002), “Consumer Trust, Value, and Loyalty in Relational Exchange,” *Journal of Marketing*, 66, 15–37.
- Spreng, R. A., S. B. Mackenzie, and R. W. Olshavsky, (1996), “A Reexamination of the Determinants of Consumer Satisfaction,” *Journal of Marketing*, 60, 15-32.
- Spreng, R. A. and R. W. Olshavsky, (1993), “A Desires Congruency Model of Consumer Satisfaction,” *Journal of the Academy of Marketing Science*, 21(3), 169-177.
- Srivastava, M. and D. Kaul, (2014), “Social interaction, convenience and customer satisfaction: The mediating effect of customer experience,” *Journal of Retailing and Consumer Services*, 21(6), 1028–1037.
- Statista, (2016), Worldwide Mobile App Revenues 2015-2020, <http://www.statista.com/statistics/269025/worldwide-mobile-app-revenue-forecast/>.
- Teng, W., H. P. Lu, and H. Yu, (2009), “Exploring the Mass Adoption of Third-generation (3G) Mobile Phones in Taiwan,” *Telecommunications Policy*, 33(10-11), 628-641.
- Thong, J. Y. L., S. J. Hong, and K. Y. Tam, (2006), “The Effects of Post-Adoption Beliefs on the Expectation-Confirmation Model for Information Technology Continuance,” *International Journal of Human-Computer Studies*, 64(9), 799-810.
- Trevino, L., R. Lengel, and R. Daft, (1987), “Media symbolism, media richness, and media choice in organizations,” *Communications Research*, 14(5), 553-74.
- Tseng, F. C., T. C. E. Cheng, K. Li, and C. I. Teng, (2017), “How does media richness contribute to customer loyalty to mobile instant messaging?” *Internet Research*, 27(3), 520-537.
- Tseng, F. C., C. I. Teng, (2014), “Antecedents for user intention to adopt another auction site,” *Internet Research*, 24(2), 205-222.
- Urbaczewski, A., J. S. Valacich, and L. M. Jessup, (2003), “Mobile Commerce Opportunities and Challenges,” *Communications of the ACM*, 46, 31-32.
- Venkatesh, V., J. Y. L. Thong, and X. Xu, (2012), “Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology,” *MIS Quarterly*, 36(1), 157-178.
- Wang, K. and C. L. Lin, (2012), “The adoption of mobile value-added services: Investigating the influence of IS quality and perceived playfulness,” *Managing Service Quality: An International Journal*, 22(2), 184-208.
- Wang, Y. S., H. H. Lin, and P. Luarn, (2006), “Predicting Consumer Intention to Use Mobile Service,” *Information Systems Journal*, 16, 157-179.
- Wu, J. H. and S. C. Wang, (2005), “What drives mobile commerce? An empirical

- evaluation of the revised technology acceptance model,” *Information & Management*, 42(5), 719-729.
- Zhang, H., Y. Lu, S. Gupta, and P. Gao, (2015), “Understanding group-buying websites continuance: An extension of expectation confirmation model,” *Internet Research*, 25(5), 767-793.
- Zhou, T., (2011), “An empirical examination of users' post-adoption behaviour of mobile services,” *Behaviour & Information Technology*, 30(2), 241-250.
- Zhou, T., (2013), “Understanding continuance usage of mobile services,” *International Journal of Mobile Communications*, 11(1), 56- 70.