

# Role of Innovation Attributes in Explaining the Adoption Intention for the Interbank Mobile Payment Service in an Indian Context

Kawaljeet Kapoor, Yogesh K. Dwivedi, and Michael D. Williams

School of Business, Swansea University, Swansea, United Kingdom  
{kawalkap, ykdwivedi}@gmail.com,  
m.d.williams@swansea.ac.uk

**Abstract.** This study presents an investigation on the role of innovation attributes that significantly influence the behavioural intention and actual adoption of potential consumers towards the *interbank mobile payment service*. Using attributes from Rogers' diffusion of innovations theory, along with one other attribute, cost, the diffusion of this IMPS application has been studied. The proposed model was empirically tested against the data gathered from both, the adopters and non-adopters of this technology. The SPSS analysis tool was used to perform the reliability tests, and linear and logistic regressions. While relative advantage, compatibility, complexity and trialability displayed significant relationships, observability exhibited a poor impact on behavioural intention. On the other hand, behavioural intention and cost showed significant impacts on the adoption of the IMPS application. The theoretical background, discussions, key conclusions, and limitations, alongside research implications of this study have been presented.

**Keywords:** Innovation, Adoption, Mobile Payment, IMPS, Diffusion of Innovations.

## 1 Introduction

The Interbank Mobile Payment Service (IMPS) is a 24/7 interbank electronic fund transfer service available as a mobile application, enabling customers to access their bank accounts via mobile phones to make the required fund transfers in a secured manner (NPCI, 2012). There are two types of this service – (a) *Person to Person* - where fund transfers between two individuals are allowed. (b) *Person to Merchant* - where fund transfers between a customer and a merchant are allowed (South Indian Bank, 2012). Liang et al. (2007) emphasize on one of the major advantages of using services on mobile phones as the ability to access services ubiquitously, through various devices. The positives of the IMPS application are clearly its round-the-clock availability, savings in terms of time and cost, transactions on a safe/secure mode, and the instant fund transfer ability. As of October, 2012, the national payments corporation of India [npci.org.in] claims that fifty banks have become the IMPS member banks. An article available on *Business Standard's* (2012) website points out that the adoption rate of this technology has been low; the industry analysts pick on this mobile application's availability to only the smart phone users as a possible

reason for the low adoption rate. *PayMate*, has now addressed this concern and provided the basic phone users with a hybrid SMS-IVR solution. However, *PayMate* has only partnered with three banks until date, which does not effectively provide a large scale solution to this problem.

Shyamala Gopinath, DG, RBI, at the inauguration of IMPS of the NPCI in Mumbai stated (22/11/2010) – “the twin challenge for India is to succeed in reducing the use of cash, while encouraging the spread and use of mobile wallet to reap the full benefits of this ubiquitous product”. She identified three stakeholders of this IMPS application– the telecom partners, the member banks, and the participating merchants, who will have to invest combined efforts to deliver the true value to their consumers, whilst sharing the costs and generated revenues amongst themselves. While 50 banks have partnered with IMPS, more banks are yet to adopt this technology. Higher the success rate of this application with the member banks, more number of other banks would want to join the IMPS league. The potential members would be interested in obtaining an insight into the factors that influence the customers to use such a mobile payment facility. What do we know about the factors that encourage consumers to use IMPS? How can we reason the low adoption rate of this technology? Is it simply the lack of cognition? Unfortunately, there are no empirical studies or official adept reports available to address these questions.

Although, there have been numerous studies examining mobile payment in the m-commerce context (Barnes, 2002; Siau and Shen, 2003; Wu and Wang, 2005), IMPS is a very recent technology in the Indian context. The features of this particular application differ from the other mobile technologies. Since the technology is very new in India, there have been no studies/publications made yet on this application. Therefore, an empirical investigation is necessary to learn about the factors that entice the consumers to use IMPS. Hence, the research aim of this study is to empirically examine the role of innovation attributes on the adoption of the IMPS technology in an Indian context. Comprehending these influential attributes could serve in assisting the stakeholders to develop competitive strategies that could promote a wider acceptance of this technology. The next section provides theoretical basis for this study and proposes a conceptual model with hypotheses; after which, the research method is explained followed by a findings section presenting the SPSS statistics, which are then discussed against the proposed hypotheses; at closure, the key conclusions, limitations and future research directions have been presented.

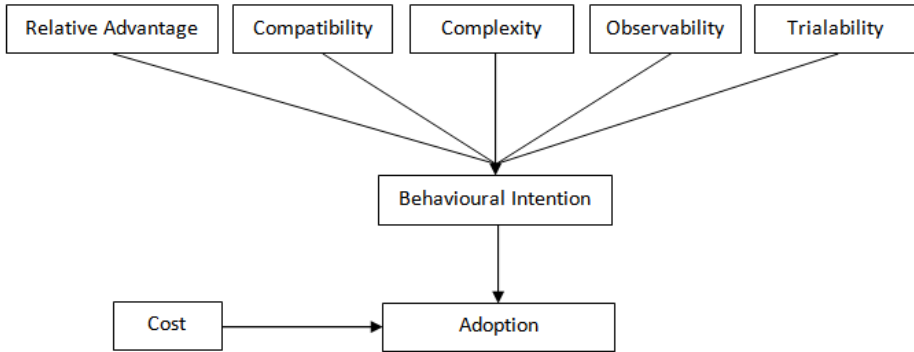
## **2 Theoretical Basis and Development of the Conceptual Model**

IMPS is clearly an integration of internet banking and mobile payment service. This application allows customers to access their bank accounts on mobile phones, using the internet from their mobile’s network providers to make a successful payment to another person or merchant. There have been numerous publications on internet banking (IB) and mobile payment services in the past - two studies on IB adoption in Hong Kong use TAM (Yiu et al., 2007) and extended TAM models (Cheng et al. 2003) and find that perceived usefulness and perceived web security have a direct effect on the use intention, the former study extends implications for retail banks in Hong Kong. Brown et al. (2004) study the impact of national environment on the IB adoption in South Africa confirming attitudinal and behavioural control factors influence the IB adoption decision.

Chen (2008) expanded the TAM model and IDT to examine the consumer acceptance of mobile payments. They found that perceived use, perceived ease of use, perceived risk, and compatibility were the determinants of adoption. Mallat (2007) conducted an exploratory study on mobile payments which showed that relative advantage and compatibility influenced adoption decisions. Schierz et al. (2010) in their empirical study found that compatibility, individual mobility and subjective norm significantly influence consumer acceptance of m-payment services. These studies show that there has been no study on IMPS in the Indian context. More obviously, this can be reasoned for the IMPS application to be very new in the Indian context. Our study, therefore aims at focussing at this application to gain an understanding of the significant determinants of the IMPS acceptance. One of the most common problems faced by many individuals and organizations in an *innovation adoption and diffusion process*, despite the obvious advantages that their innovation already has to readily offer, is of how to speed up the rate of diffusion of their innovation(s) (Rogers, 2003). To address this concern with respect to the IMPS application, our study uses Rogers' *innovation attributes* alongside one another added attribute, *cost*, the justification of which has been provided in the later part of this section. There are many models available for predicting the user behaviour towards a given innovation like – TAM, UTUT, theory of reasoned action, and theory of planned behaviour, but all of these models tend to use similar attributes. The innovation of diffusion theory is more established and uses a set of attributes different from those used by the above mentioned models. Thus, our study borrows attributes from the Rogers' innovation diffusion theory for exploration purposes in the IMPS context.

To explain the process of diffusion, Rogers recognized five attributes – *Relative Advantage, Compatibility, Complexity, Trialability, and Observability* as the innovation attributes. Over the years, majority of the studies have chosen to use and study these five innovation attributes (Tornatzky and Klein, 1982; Greenhalgh et al., 2004; Legare et al., 2008; Hester and Scott, 2008). TRA (Ajzen and Fishbein, 1980) studied only intention on adoption. TPB (Ajzen, 2006) studied intention and actual behavioural control on adoption. The decomposed theory of planned behaviour (Taylor and Todd, 1995) studied intention and perceived behavioural control on adoption. TAM (Davis et al., 1989) also studied only behavioural intention on adoption. Based on the aforementioned theories, our study decided that Rogers' five attributes will be studied against behavioural intention, and behavioural intention in turn will be studied against adoption. Since IMPS is an innovation involving cost, this attribute was looked upon with interest. Previous studies on mobile payments consider cost as an important influencing factor in making the adoption decision – Dahlberg et al. (2007) point out that researchers find costs in the form of transaction fee to be a barrier of adoption. Another qualitative study on adoption of mobile payments found the premium pricing of payments to be a barrier of adoption (Mallat, 2007). Additional to the apparent costs of adopting an m-commerce innovation, a consumer is often subjected to relatively hidden transaction charges which could considerably influence the adoption decision of that particular innovation (Hung et al., 2003; Wu and Wang, 2005).

Interestingly, all of the above mentioned studies discuss the influence on cost on adoption and not on intention. This could be because a consumer can form favourable intentions towards such innovations (internet banking/mobile payments) without having to actually use (spend money on) that innovation, but when it comes to making an actual transaction, the different aspects of charges associated with that transaction



**Fig. 1.** Proposed conceptual model for examining intention and adoption of IMPS

come into picture. This is when the consumer makes the critical decision of adoption or rejection based on how appealing or unappealing is the charge associated to that transaction. Therefore, it was decided for cost to be regressed only against adoption. It was thereby concluded that - *relative advantage*, *compatibility*, *complexity*, *trialability*, *observability* and *cost* will be studied to examine the adoption intention and the actual adoption of the IMPS application in an Indian context (fig.1).

**2.1 Relative Advantage**

By definition, relative advantage is the degree to which an innovation is better than the idea that it is superseding (Rogers, 2003). This attribute has been studied across many different technologies – mobile internet (Hsu et al., 2007) and online portal (Shih, 2008) studies revealed in their findings that a higher degree of offered advantage is related to increased levels of adoption intentions. An organizational study on intention to adopt distributed work arrangements found relative advantage was positively related to use intention (Sia et al., 2004). Since the IMPS application supersedes the idea of performing financial transactions on laptops/personal computers, and allows the same transactions on-the-go, this attribute was deemed appropriate.

**H1:** *Relative Advantage will significantly influence the users’ behavioural intentions.*

**2.2 Compatibility**

Compatibility is the degree to which an innovation is consistent with the existing values, past experiences and needs of potential adopters (Rogers, 2003). This attribute has been studied across different mobile technologies. Examples include the mobile network and mobile internet studies which reveal that compatibility has a significant and positive influence on the consumer intentions (Hsu et al., 2007; Shin, 2010). An empirical study on mobile ticketing service adoption found that compatibility was a strong predictor of use intention (Mallat et al., 2008). In the IMPS context, in order to learn how similar or different, the consumers find transferring money to the desired client/merchant accounts on a mobile phone, this attribute was studied in further detail.

**H2:** *Compatibility will positively influence the users’ behavioural intentions.*

### 2.3 Complexity

It is degree to which an innovation is perceived as difficult to understand and use (Rogers, 2003). Greater complexity implies increased degree of difficulty in understanding the use of a given innovation. Therefore complexity is assumed to be negatively associated to use intentions. A mobile marketing adoption study shows that complexity has a direct influence on user's adoption intentions (Tanakinjal, 2010). Studies on online portal use (Shih, 2008) and automatic cash payment system (Yang et al., 2006) found, complexity had a significant negative impact on use intention. Using the IMPS application on a mobile phone may be perceived differently by different users on the complexity scale, based on their skill and adaptability levels.

**H3:** *Lower complexity will positively influence the users' behavioural intentions.*

### 2.4 Trialability

Rogers (2003) defines trialability as the degree to which an innovation is available to be experimented for a limited period prior to its actual adoption/rejection. Many internet banking and mobile internet studies are available – a mobile internet study found that trialability was not a significant predictor of adoption intention (Hsu et al., 2007). Arts et al. (2011) in generalizing consumer innovation adoption argue that trialability enhances consumer readiness and has a stronger effect at the behaviour stage, negatively affecting adoption behaviour. It is important to understand, how trialability of IMPS can affect its adoption intention.

**H4:** *Trialability will significantly influence the users' behavioural intentions.*

### 2.5 Observability

Observability is defined as the degree to which the results of an innovation become clearly visible to others (Rogers, 2003). A technology products study (Vishwanath and Goldhaber, 2003) found observability significantly impacted intention. Arts et al (2011) in their meta-analysis on drivers of intention and behaviour, showed a partial support to the notion that observability will have a stronger effect at the intention stage. In order to receive more clarity on the effect of this attribute, it has been posited as,

**H5:** *Observability will significantly influence the users' behavioural intentions.*

### 2.6 Cost

Tornatzky and Klein (1982) posited cost to be negatively associated with the adoption of an innovation. According to them lesser the cost of adopting an innovation, higher will be the probability of it being adopted immediately. A study on mobile virtual network hypothesizes for cost to negatively influence usage behaviour (Shin, 2010). More conclusions on the effect of cost on the adoption of an innovation (from the previous studies) have already been discussed in section 2. In using the IMPS application, the consumers incur a certain charge per transaction, plus this application is not compatible with all mobile phones. It more specifically runs best on smart phones. In order to account for these potential costs, this attribute was taken into consideration.

**H6:** *Lower Costs will positively influence the adoption of IMPS.*

## 2.7 Behavioural Intention

Apart from the aforementioned six attributes, the effect of behavioural intention on adoption was also included to be measured. Gumussoy and Calisir (2009) cite Ajzen and Fishbein (1980) to define behavioural intention as a measure of the likelihood of a person getting involved in a given behaviour. They point at behavioural intention to be an immediate determinant of actual use. Stronger the intention, greater will be the probability of use. Most studies supported for this attribute to have a positive influence on the actual use (Chen et al., 2002; Ajjan and Hartshorne, 2008; Gumussoy and Calisir, 2009); Ajjan and Hartshorne (2008) also cite Ajzen (1991) suggesting that behavioural intention acts as the most important determinant of the adoption decision.

**H7:** *Behavioural Intention positively influences the adoption of IMPS.*

## 3 Research Method

### 3.1 Survey Instrument

The instrument used for data collection was a questionnaire comprising of 36 questions, out of which, eight were demographic by nature – four out of these were multiple choice, respondent specific questions - focussed on *age, gender, education* and *occupation* of the respondent; the remaining four were multiple choice, technology specific questions - focussed on the *adoption factor, innovation type, duration of adoption, and frequency of usage*. A seven point likert scale was used to measure the attitude of the respondents to the remaining 28 questions. These 28 questions were designed to cover the seven shortlisted constructs. The seven attributes were made up of four items each (table 1).

**Table 1.** Constructs-Questions Mapping

| Constructs            | Questions  | Source(s)  |
|-----------------------|--|--|
| Behavioural Intention | BI1: I plan to continue using/use IMPS.  | Karahanna et al. (1999); Teo and Pok (2003); Shih and Fang (2004)                      |
|                       | BI2: My willingness of using/continuing to use IMPS is high.                   |  |
|                       | BI3: I intend to use/continue using IMPS.                                      |  |
|                       | BI4: The likelihood that I will use/continue using IMPS is high.               |  |
| Triability            | T1: I know the bank which provides/offers IMPS.                                | Moore and Benbasat (1991)  |
|                       | T2: IMPS mobile application is easily available to get familiar with.          |  |
|                       | T3: I do/did not have to expend much effort in trying the IMPS.                |  |
|                       | T4: I do/did not have adequate opportunities to try the IMPS application.      |  |
| Relative Advantage    | RA1: IMPS provides quicker access to the transactions that I need to make.     | Moore and Benbasat (1991)  |
|                       | RA2: IMPS provides greater flexibility.  |  |
|                       | RA3: IMPS will help/helps me gain greater control over my finances.            |  |
|                       | RA4: IMPS will help/helps complete all my financial transactions on time.      |  |
| Compatibility         | CT1: IMPS is/will be compatible with all of my financial transfer needs.       | Moore and Benbasat (1991)  |
|                       | CT2: IMPS will fit/fits well with the type of transactions that I perform.     |  |
|                       | CT3: Using IMPS fits/will fit well with my lifestyle.                          |  |
|                       | CT4: My mobile phone is compatible with the IMPS application.                  |  |
| Complexity            | CP1: Using IMPS will be/is challenging and frustrating.                        | Moore and Benbasat (1991); Shih and Fang (2004); Yang et al. (2006); Richardson (2009) |
|                       | CP2: Learning to use IMPS will be/is easy for me.                              |  |
|                       | CP3: Easy to operate interbank service is important to me.                     |  |
|                       | CP4: I find it easy for me to be skilful at using the IMPS mobile application. |  |
| Cost                  | C1: IMPS is inexpensive.   | Mallat et al. (2008); Koenig-Lewis et al. (2010)                                       |
|                       | C2: The cost of making a financial transfer with IMPS is reasonable.           |  |
|                       | C3: Buying a phone compatible with this IMPS application is expensive.         |  |
|                       | C4: IMPS Transactions are the most affordable single transfer type for me.     |  |
| Observability         | O1: Being seen as a user of IMPS is good for my image.                         | Meuter et al. (2005); Richardson (2009)  |
|                       | O2: People who use IMPS are not very visible in my social circle.              |  |
|                       | O3: I have seen others using IMPS.   |  |
|                       | O4: I do not know anyone who uses IMPS.  |  |

### 3.2 Pilot Study

The questionnaire was tested against a small sample size to improve upon the instrument design prior to the full scale roll-out of this study. The pilot study was done on a sample of 30 respondents. It was ensured that the population for this study included respondents from all age groups to ensure their understandability of the questionnaire. The respondents' feedback revealed that although the questionnaire was clear and simple by understanding, it appeared to be repetitive. Minor suggestions that were made were addressed and the questionnaire was amended suitably.

### 3.3 Data Collection

All-India data was to be accumulated and therefore it was decided to collect equal number of responses from all of the four – *northern (Delhi City)*, *eastern (Kolkata City)*, *western (Mumbai City)* and *southern (Bangalore City)* regions of India. A total of 330 respondents participated in this survey. Upon the receipt of the questionnaires, it was found that seven questionnaires were incomplete. In the interest of data accuracy and reliability, these seven questionnaires were discarded, and a total of 323 questionnaires were subjected to further analyses. The SPSS data analysis software was used to produce results on the gathered data, the findings of which are made available in section 4. The findings section will provide for results from the (a) frequency tests on the demographic characteristics (b) *reliability test* showing the internal consistencies of the construct items (c) *descriptive test* generating the means and standard deviations for all of the seven constructs (d) *regression analyses*, both *linear* and *logistic*, in order to test the stated hypotheses, and (e) *multicollinearity test* to check for the correlation amongst the predictor variables.

## 4 Findings

### 4.1 Demographics

Table 2 is descriptive of the demographic characteristics for this study's respondent-profile. Clearly, the 18-24 age group, the male respondents (53.6%), and the graduates (38.1%) formed the largest proportion groups for our dataset.

Table 3 discloses the demographics specific to use of IMPS, and shows that out of the 323 respondents, there were 249 non-adopters and only 74 adopters (22.9%) of IMPS.

**Table 2.** Demographic Characteristics

| Variable  | Group                   | Frequency  | Percentage   |
|-----------|-------------------------|------------|--------------|
| Age       | 18-24                   | 104        | 32.2         |
|           | 25-34                   | 101        | 31.3         |
|           | 35-44                   | 51         | 15.8         |
|           | 45-54                   | 46         | 14.2         |
|           | 55-64                   | 21         | 6.5          |
|           | 65-74                   | 0          | 0            |
|           | Above 75                | 0          | 0            |
|           | <b>Total</b>            | <b>323</b> | <b>100.0</b> |
| Gender    | Male                    | 173        | 53.6         |
|           | Female                  | 150        | 46.4         |
|           | <b>Total</b>            | <b>323</b> | <b>100.0</b> |
| Education | Secondary School        | 3          | 0.9          |
|           | Higher Secondary        | 62         | 19.2         |
|           | Diploma                 | 31         | 9.6          |
|           | Graduate                | 123        | 38.1         |
|           | Postgraduate – Taught   | 71         | 22.0         |
|           | Postgraduate – Research | 12         | 3.7          |
|           | Other                   | 21         | 6.5          |
|           | <b>Total</b>            | <b>323</b> | <b>100.0</b> |

**Table 3.** Use-Specific Demographic Characteristics

| Variable         | Group                | Frequency  | Percentage |
|------------------|----------------------|------------|------------|
| Application Type | Person to Person     | 32         | 9.9        |
|                  | Person to Merchant   | 42         | 13         |
|                  | Non Adopters         | 249        | 77.1       |
|                  | <b>Total</b>         | <b>323</b> | <b>100</b> |
| Usage Duration   | <=12 Months          | 30         | 9.3        |
|                  | 12-24 Months         | 37         | 11.5       |
|                  | 25-36 Months         | 4          | 1.2        |
|                  | >36 Months           | 1          | 0.3        |
|                  | Other                | 2          | 0.6        |
|                  | Non Adopters         | 249        | 77.1       |
|                  | <b>Total</b>         | <b>323</b> | <b>100</b> |
| Usage Frequency  | Several times a day  | 1          | 0.3        |
|                  | Once a day           | 7          | 2.2        |
|                  | 1-2 days a week      | 20         | 6.2        |
|                  | 3-5 days a week      | 19         | 5.9        |
|                  | Once every few weeks | 16         | 5          |
|                  | Less often           | 11         | 3.4        |
|                  | Non Adopters         | 249        | 77.1       |
|                  | <b>Total</b>         | <b>323</b> | <b>100</b> |



## 4.2 Reliability Test

A reliability test was carried out to learn the internal consistencies of the individual items forming each of the utilized constructs (Table4). There were four constructs for which one item each was deleted in order to arrive at better  $\alpha$  values. Hinton et al. (2004) illustrated that as a representative of reliability, the Cronbach's alpha could be read across four different reliability types:  $\geq 0.90$  - excellent; 0.70-0.90 - high; 0.50-0.70 - moderate; and  $\leq 0.50$  - low. Out of the seven constructs, there were four constructs with high, and three with moderate reliabilities. Higher the Cronbach's alpha values, greater is the consistency amongst the individual items making up a given construct.

**Table 4.** Reliability Test

| Constructs            | Sample Size | Number of Items | Cronbach's Alpha ( $\alpha$ ) | Number of Items | Improved Alpha ( $\alpha$ ) | Reliability Type |
|-----------------------|-------------|-----------------|-------------------------------|-----------------|-----------------------------|------------------|
| Behavioural Intention | 323         | 4               | 0.87                          | 4               | 0.87                        | High             |
| Trialability          | 323         | 4               | 0.569                         | 3               | 0.649 (T4)                  | Moderate         |
| Relative Advantage    | 323         | 4               | 0.788                         | 4               | 0.788                       | High             |
| Compatibility         | 323         | 4               | 0.713                         | 4               | 0.713                       | High             |
| Complexity            | 323         | 4               | 0.497                         | 3               | 0.629 (CP1)                 | Moderate         |
| Cost                  | 323         | 4               | 0.659                         | 3               | 0.752 (C3)                  | High             |
| Observability         | 323         | 4               | 0.523                         | 3               | 0.585 (O3)                  | Moderate         |

## 4.3 Descriptive Statistics

Table 5 provides for the results from the descriptive test. The statistics were extracted in the ascending order of the mean values.

**Table 5.** Descriptive Statistics: Importance of various innovation-attributes

| Constructs            | N   | n | Mean | Std. Deviation |
|-----------------------|-----|---|------|----------------|
| Observability         | 323 | 4 | 4.28 | 1.114          |
| Trialability          | 323 | 4 | 4.61 | 1.063          |
| Behavioural Intention | 323 | 4 | 4.63 | 1.242          |
| Cost                  | 323 | 4 | 4.69 | 1.021          |
| Complexity            | 323 | 4 | 4.74 | 0.961          |
| Compatibility         | 322 | 4 | 4.77 | 1.224          |
| Relative Advantage    | 323 | 4 | 4.89 | 1.113          |

## 4.4 Regression Analysis

Regression analysis is a statistical technique that predicts the values of one dependent variable using the values of one or more other independent variables (Allen, 2004). This study underwent two types of regression analysis – (a) Linear regression (b) Logistic Regression, which were performed on a total of 323 cases.

## Linear Regression

Worster et al. (2007) stated that linear regression assumes a linear relationship between the dependent and independent variable(s). A linear regression was performed taking *Behavioral Intention* as the dependent variable, and the Rogers' five attributes as the independent variables (Table6). The resultant model significantly predicted the behavioral intention of the target population towards IMPS ( $F(5, 323) = 40.919$ ,  $p=0.000$ ). The model explains 39.3% of the variance. While four variables were found to have a significant effect, observability did not have any effect on the behavioral intention.

**Table 6.** Linear Regression

| Independent Variables  | Standardized Coefficients (Beta) | t     | Sig. | Collinearity Statistics (VIF) | Hypotheses Support |
|--|----------------------------------|-------|------|-------------------------------|--------------------|
| (Constant)   |                                  | .032  | .974 |                               |                    |
| Relative Advantage   | .386                             | 6.655 | .000 | 1.749                         | H1: Supported      |
| Compatibility  | .164                             | 2.707 | .007 | 1.904                         | H2: Supported      |
| Complexity   | .156                             | 2.824 | .005 | 1.589                         | H3: Supported      |
| Trialability   | .111                             | 2.057 | .040 | 1.502                         | H4: Supported      |
| Observability  | -.080                            | -1.51 | .132 | 1.456                         | H5: Not Supported  |
| <b>MODEL DETAILS</b>   |                                  |       |      |                               |                    |
| <b>Adjusted R square = 0.393; F = 40.919; Significance = 0.000</b> |                                  |       |      |                               |                    |

## Multicollinearity Test

According to Brace et al. (2003) multicollinearity is a situation where a high correlation is detected between two or more predictor variables, which cause problems in drawing inferences about the relative contribution of each predictor variable to the success of the model. The VIF values for this regression analysis vary between 1.456 and 1.904 (Table6). Clearly, these values are significantly lower than the maximum value of 10 (Irani et al., 2009). Thus, the independent variables for this study are free from the multicollinearity problem. The likelihood of the reported variance explained by these independent variables to be close to the real situation is therefore very high.

## Logistic Regression

According to Worster et al. (2007), in logistic regression, the outcome variable must be categorical with two possible outcomes, i.e. it should be dichotomous. A logistic regression was performed with adoption as the dependent variable, and behavioural intention and cost as the predictor variables, the results of which are available in table7. The full model significantly predicted the adoption decision of the IMPS users. The model accounted for between 11.1% and 16.8% of the variance (Table8) in the adoption decision. As available in table9, 95.2% of the non-adopters were successfully predicted. However, only 6.8% of predictions for the adopter group were accurate. Overall, 74.9% of the predictions were accurate. Table 10 gives coefficients, Wald statistics, associated degrees of freedom, and probability values for the two predictor variables.

**Table 7.** Omnibus Tests of Model Coefficients

|        |       | Chi-square | df | Sig. |
|--------|-------|------------|----|------|
| Step 1 | Step  | 38.000     | 2  | .000 |
|        | Block | 38.000     | 2  | .000 |
|        | Model | 38.000     | 2  | .000 |

**Table 8.** Model Summary

| Step | -2 Log likelihood | Cox & Snell R Square | Nagelkerke R Square |
|------|-------------------|----------------------|---------------------|
| 1    | 309.670           | .111                 | .168                |

**Table 9.** Classification Table

|                    | Observed | Predicted        |    |                    |      |
|--------------------|----------|------------------|----|--------------------|------|
|                    |          | Installed or Not |    | Percentage Correct |      |
|                    |          | Yes              | No |                    |      |
| Step 1             | Adoption | Yes              | 24 | 50                 | 6.8  |
|                    |          | No               | 14 | 233                | 95.2 |
| Overall Percentage |          |                  |    |                    | 74.9 |

**Table 10.** Variables in the equation

| Variables             | B     | S.E. | Wald   | df | Sig. | Exp(B) | 95% C.I. for EXP(B) |       | Hypotheses Support |
|-----------------------|-------|------|--------|----|------|--------|---------------------|-------|--------------------|
|                       |       |      |        |    |      |        | Lower               | Upper |                    |
| Behavioural Intention | -.531 | .145 | 13.385 | 1  | .000 | .588   | .443                | .782  | H6: Supported      |
| Cost                  | -.423 | .165 | 6.545  | 1  | .011 | .655   | .474                | .906  | H7: Supported      |
| Constant              | 5.871 | .907 | 41.944 | 1  | .000 | 354.6  |                     |       |                    |

## 5 Discussion

### 5.1 Hypotheses Testing

A total of seven hypotheses were formulated and tested to examine the influence of the independent variables on the dependent variables (Adoption and Behavioural Intention). Only six of these seven hypotheses were supported by data (H1, H2, H3, H4, H6, and H7). As posited, the data confirms that relative advantage, compatibility, complexity and trialability have significant impacts on the *behavioural intentions* of the targeted consumers in the IMPS context. Internet banking and telebanking can be seen as the predecessors of IMPS in the Indian context. In terms of compatibility, IMPS is much faster than telebanking. IMPS provides consumers with quicker access

to their bank accounts, and offers greater flexibility in terms of the type of payment they need to make. Along with its 24/7 availability, the mobility feature of the IMPS application surpasses internet banking, in that, IMPS allows access to the consumers from anywhere, anytime, via their mobile networks, without having the need to connect through routers/modems to gain internet/Wi-Fi access. From the data results, clearly, the users perceive IMPS to be an easy to use mobile application. Studies from the past are a supportive proof of these facts - Slyke et al. (2002) used IDT in studying groupware applications and found that *relative advantage*, *complexity* and *compatibility* significantly influenced intention. Chen et al. (2002) applied IDT to study the consumer attitudes towards virtual stores and found *compatibility* to be strong determinant of consumer intentions. Hsu et al. (2007) studied the adoption of MMS using IDT, and concluded for *relative advantage* and *compatibility* to significantly influence the user intentions. Lee and Kozar (2008) combined IDT, TPB, IT ethics, and morality in an empirical investigation on the anti-spyware software adoption, and found that relative advantage and compatibility showed significant effect on adoption intention. Trialability also succeeded in successfully explaining the consumer's adoption intention (hypothesis 4). Meuter et al. (2005) concluded that trialability serves in clarifying the role of potential adopters by helping evaluating their ability to use that innovation, and thus enhancing the consumer readiness towards the given innovation. IMPS is an application which comes with no installation charge or usage clause, i.e. it is a service available for the consumers to use if and when required. In other words, IMPS comes with an unlimited trial period. The consumers can opt to use this application once, or any number of times without any trial obligations, and return to using it again if the service is appealing to them, or simply quit using it, otherwise.

Hypothesis 5 for this study was not supported by the data, in which *observability* failed to make a significant impact on the consumer intention to adopt IMPS. A recent study on consumer innovations adoption also found that observability was not significantly related to intention (Arts et al, 2011). According to Meuter et al. (2005), observability may assist in showing positive outputs, which in turn may motivate the adopters to receive that innovation's rewards. IMPS is purely a mobile application. The visibility of this innovation is not that apparent. To illustrate in more detail – a study on e-book reader (Jung et al., 2011) found that observability had a significant relationship with consumers' intention to use. This is because an e-reader is a whole instrument in itself which is visible when carried around, and whose outcomes can be observed at visibility, thereby significantly affecting the potential consumers' intentions. The case of IMPS, here, is a complete opposite. The use of IMPS application by an active user will not be evidently visible to the eyes of the others, unless the use and the outcomes of using the IMPS application are explicitly discussed with its active users. This effectively makes IMPS less observable in comparison to other innovative products like tablets, e-readers, smart phones etc. This in turn can be reasoned to justify the insignificance displayed by our study's data for observability towards the use intentions.

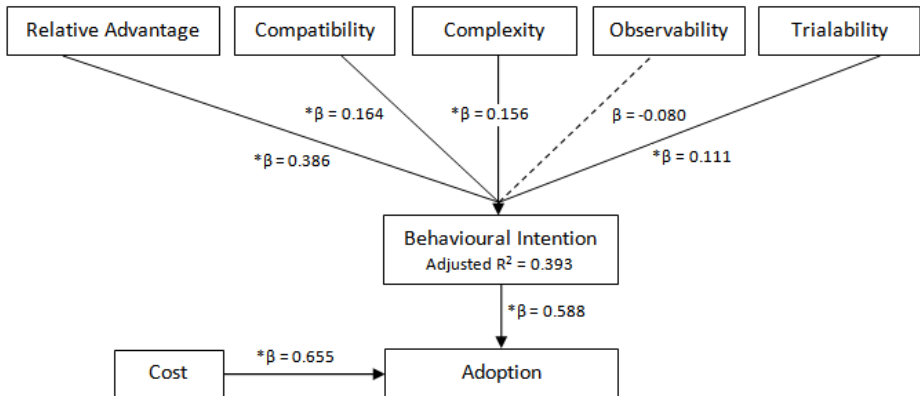
The data for this study also confirms the hypotheses with respect to the *adoption* of the IMPS application. It was confirmed that both, cost and behavioural intention significantly affected the adoption of IMPS. Tornatzky and Klein (1982) identified increased costs as inhibitors of the adoption of any innovation. As previously

explained in section 2, the former studies are in conformance with the fact that high costs act as retarding agents in the acceptance of a diffusing innovation. In terms of cost, clearly an application like IMPS can incur three kinds of charges – (a) charge per transaction (b) cost of the compatible mobile phone (c) charges on the data being used from the mobile network providers. Our study’s results however show that the existing and potential consumers find these charges to be affordable. Thus, it can be concluded that although IMPS comes with a cost, this application is viewed as inexpensive which in turn encourages adoption.

Similarly, with behavioural intention, the past studies have been in accordance with our findings – Taylor and Todd (1997), while studying the determinants of consumer compositing behaviour found that behaviour was significantly influenced by behavioural intention. Shin (2010), in studying the policy implications of mobile virtual network adopter diffusion also found for behavioural intention to have a significant effect on the actual behaviour. Hartshorne and Ajjan (2009) cite Sheppard et al., (1998) and Ajzen (1991) to support that the previous literature also finds a strong association between actual behaviour and the behavioural intention, which has also been confirmed in the IMPS context, in our study.

### 5.2 Validated Conceptual Model

Figure 2 is representative of the validated model for the factors influencing the behavioural intention and adoption of the IMPS application, as proposed in section 2. The dotted line running from observability to behavioural intention represents that path as insignificant, and the remaining paths from the remaining attributes to behavioural intention are shown to be the significant. Similarly, the paths from cost and behavioural intention to adoption have been shown as significant.



**Fig. 2.** Validated model illustrating attributes influencing the intention and adoption of IMPS

In terms of performance, the  $R^2$  values for adoption were measured across the Cox and Snell  $R^2$  (0.111) and Nagelkerke  $R^2$  (0.168). These two values were found to be comparatively lower than the values from the earlier studies measuring influences of different independent variables on the adoption of a given innovation (Ungan, 2004;

Gounaris and Koritos, 2008; Li, 2008). To exemplify a few, Ramamurthy et al (2008) reported values of Cox and Snell  $R^2$  – 0.412 and Nagelkerke  $R^2$  – 0.550; Wang et al (2010) reported Cox and Snell  $R^2$  value of 0.51 and Nagelkerke  $R^2$  value of 0.69, which are again higher than the values reported by our study (the variance is not very well explained). The adjusted  $R^2$  value for behavioural intention was 0.393. These  $R^2$  values are comparative to the values from former studies (Taylor and Todd, 1997; Ajjan and Hartshorne, 2008; Hartshorne and Ajjan, 2009). For instance, Gumussoy and Calisir (2009) reported an adjusted  $R^2$  value of 0.14, which is much lower than the  $R^2$  value of 0.393 (which is higher in value and better) reported by our study. Similarly, another study by Lin (2008) reported an  $R^2$  value of 0.30 for a TAM model and an  $R^2$  value of 0.35 for a decomposed TBP model, both of which are clearly lower than the reported  $R^2$  value of this study. The above comparisons evidently suggest that the performance of the validated model (figure 2) is satisfactory (the variance is well explained).

### 5.3 Research Contributions and Practical Implications

This piece of work is a contribution to the existing literature on the diffusion of innovation attributes, as Rogers' five attributes were studied and tested in a new context with this study: *IMPS application in the Indian context*. According to the authors' best knowledge, the IMPS technology is very new in the Indian context, and there have been no research publications made on this technology yet. Hence, the findings from this study should succeed in providing the first insights into how Rogers' attributes, alongside cost, behave with behavioural intention and adoption aspects of the IMPS application. Both, adoption and intention have been studied in parallel to augment the existing research paradigm with more constructive and broader results.

Considering the statement made by the director general of RBI, from the commercial perspective, mobile wallet is becoming a vital part of our transaction systems. Thus, in order to work towards its broader acceptance, the issues of building, promoting, and maintaining the consumers' interest in using such a service becomes important. The findings from this study showed that observability of IMPS was poor, because of which this construct made no impact in building positive intentions of the consumers towards the IMPS application. This result from our study thus indicates that it is important for the banks to rethink strategies on educating the target mass and making them aware of the positives of IMPS, to promote this application in the interest of improvising and attaining the desired type of financial transaction system in India. The results reveal that out of the 323 targeted population, only 22.9% (table3) formed the adopters of IMPS. As discussed in section5, with the prior existence of systems like internet banking and telebanking, consumers already have established banking styles and finance management systems. The low adoption rates indicate that, for mobile banking to overpower these already existing systems, the real challenge for the banks promoting the IMPS application will be to offer consumers with not just the equivalent services (from its predecessors), but with more attractive, easy to use features to draw more consumers towards its adoption.

## 6 Conclusions

This study affirms the many established innovation adoption and diffusion notions established by former studies by extending them in the IMPS context. Using Rogers' innovation attributes, alongside cost and behavioural intention, we develop an integrative model to study the influence of these attributes on the adoption of the IMPS application in the Indian context. The results from this study yielded key insights concerning the determinants of IMPS adoption from the proposed conceptual model. The model confirmed that a consumers' usage of IMPS can be predicted from their intentions. It also revealed that IMPS was perceived as inexpensive, and that the low costs associated to this mobile application facilitated its adoption. On the other hand, relative advantage, compatibility, lower complexity and trialability were found to be the significant determinants of the consumers' intention to use the IMPS application. The model also rendered observability as an insignificant determinant of the consumer's intention to use IMPS.

### 6.1 Limitations and Future Research Directions

Although, the current research aims to study the diffusion of IMPS in an Indian context, the data collected was limited to only four states representing each of the north, east, west, and south regions of India. The other cities of the country may bear certain cultural differences that may facilitate or impinge the adoption of IMPS. The future researchers may focus on the cultural factors, and more importantly focus on gathering the data from more number of cities in the country to bring to light the differences in state-wise adoption of this application, if any. Also, future researchers may want to investigate issues such as social influences using qualitative data, which may also fairly impact the adoption of such mobile payment innovations.

This study restricted its focus to only five of Rogers' innovation attributes, alongside cost as an added attribute of study. However, there are other innovation attributes apart from Rogers' five attributes that have been used and reviewed in the past, but not as much as Rogers' attributes. One study that has remarkably reviewed and listed more of such innovation attributes is the meta-analysis presented by Tornatzky and Klein from 1982. They recognized 25 other attributes as innovation attributes, in addition to Rogers' five attributes. Another significant contribution in this field has been a study by Moore and Benbasat from 1991, wherein they developed an instrument to measure individual perceptions taking a total of eight attributes into consideration. It would be interesting to get an insight into how the adoption of IMPS is affected by these other innovation attributes. Therefore, the future research may shift focus towards studying these other innovation attributes in the IMPS context to attain a deeper understanding of its diffusion process.

Our study focussed on studying the relationship between Rogers' innovation attributes and behavioural intention only, the future researchers may consider studying the direct influence of Rogers' attributes on the adoption aspect on IMPS. The findings from the logistic regression (Table 8) showed low  $R^2$  values for Cox and Snell and Nagelkerke, indicating that the total variance explained for adoption of IMPS is slightly lesser for our model. The future researchers may consider incorporating more number of adoption attributes for attaining a better explanation of

the variance. Finally, as Rogers' (2003) states, diffusion is a process by which an innovation is communicated through certain channels over time. Given how new the IMPS application is, to have a more collective and constructive understanding, its adoption and diffusion process will have to be empirically investigated at different points in time.

## References

- Ajjan, H., Hartshorne, R.: Investigating faculty decisions to adopt Web 2.0 technologies: Theory and empirical tests. *Internet and Higher Education* 11, 71–80 (2008)
- Ajzen, I.: The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes* 50, 179–211 (1991)
- Ajzen, I., Fishbein, M.: *Understanding attitudes and predicting behaviour*. Prentice Hall, Englewood Cliffs (1980)
- Ajzen, I.: Behavioural interventions based on the theory of planned behavior. *Journal of Applied Social Psychology* 32, 665–683 (2006)
- Allen, M.P.: *Understanding Regression Analysis*. Springer (2004)
- Arts, J.W.C., Frambach, R.T., Bijmolt, T.H.A.: Generalizations on consumer innovation adoption: A meta-analysis on drivers of intention and behaviour. *International Journal of Research in Marketing* 28, 134–144 (2011)
- Barnes, S.J.: The mobile commerce value chain: analysis and future developments. *International Journal of Information Management* 22, 91–108 (2002)
- Brace, N., Kemp, R., Snelgar, R.: *SPSS for psychologists: a guide to data analysis using SPSS for windows*. Palgrave Macmillan, New York (2003)
- Brown, I., Hoppe, R., Mugera, P., Newman, P., Stander, A.: Environment on the Adoption of Internet Banking: Comparing Singapore and South Africa. *Journal of Global Information Management* 12, 1–26 (2004)
- Business Standard (2012), <http://www.business-standard.com/india/news/paymate-powers-inter-bank-mobile-payment-services-in-india/438160/> (accessed on: October 20, 2012)
- Chen, L.-D., Gillenson, M.L., Sherrell, D.L.: Enticing Online Consumers: an extended technology acceptance perspective. *Information and Management* 39, 705–719 (2002)
- Chen, L.-D.: A model of consumer acceptance of mobile payment. *International Journal of Mobile Communications* 6, 32–52 (2008)
- Chen, L., Gillenson, M.L., Sherrell, D.L.: Enticing online consumers: an extended technology acceptance perspective. *Information and Management* 39, 705–719 (2002)
- Davis, F.D., Bagozzi, R.P., Warshaw, P.R.: User acceptance of computer technology: A comparison of two theoretical models. *Management Science* 35, 982–1003 (1989)
- Dahlberg, T., Mallat, N., Ondrus, J., Zmijewska, A.: Past, present and future of mobile payments research: A literature review. *Electronic Commerce Research and Applications* 7, 165–181 (2007)
- Gumusoy, C.A., Calisir, F.: Understanding factors affecting e-reverse auction use: An integrative approach. *Computers in human behaviour* 25, 975–988 (2009)
- Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., Kyriakidou, O.: Diffusion of Innovations in Service Organizations: Systematic Review and Recommendations. *The Milbank Quarterly* 82, 581–629 (2004)
- Gounaris, S., Koritos, C.: Investigating the drivers of internet banking adoption decision: A comparison of three alternative frameworks. *International Journal of Bank Marketing* 26, 282–304 (2008)



- Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., Kyriakidou, O.: Diffusion of Innovations in Service Organizations: Systematic Review and Recommendations. *The Milbank Quarterly* 82, 581–629 (2004)
- Grepott, T.J.: Attribute perceptions as factors explaining Mobile Internet acceptance of cellular customers in Germany – An empirical study comparing actual and potential adopters with distinct categories of access appliances. *Expert Systems with Applications* 38, 2148–2162 (2011)
- Hartshorne, R., Ajjan, H.: Examining student decisions to adopt Web 2.0 technologies: theory and empirical tests. *Journal of Computer Higher Education* 21, 183–198 (2009)
- Hernandez, J.M.C., Mazzon, J.A.: Adoption of internet banking: proposition and implementation of an integrated methodology approach. *International Journal of Bank Marketing* 25, 72–88 (2007)
- Hester, A.J., Scott, J.E.: A conceptual model of wiki technology diffusion. In: *Proceedings of the 41st Hawaii International Conference on System Sciences* (2008)
- Hsu, C.-L., Lu, H.-P., Hsu, H.-H.: Adoption of the mobile Internet: An empirical study of multimedia message service (MMS). *Omega* 35, 715–726 (2007)
- Irani, Z., Dwivedi, Y.K., Williams, M.D.: Understanding Consumer Adoption of Broadband: An Extension of Technology Acceptance Model. *Journal of Operational Research Society* 60, 1322–1334 (2009)
- Jung, J., Chan-Olmsted, S., Park, B., Kim, Y.: Factors affecting e-book reader awareness, interest, and intention to use. *New Media and Society* 14, 204–224 (2011)
- Karahanna, E., Straub, D.W., Chervany, N.L.: Information technology Adoption Across Time: A Cross-Sectional Comparison of Pre-Adoption and Post-Adoption Beliefs. *MIS Quarterly* 23, 183–213 (1999)
- Lee, Y., Kozar, K.: An empirical investigation of anti-spyware software adoption: A multi-theoretical perspective. *Information & Management* 45, 109–119 (2008)
- Le'gare', F., Ratte', S., Gravel, K., Graham, I.D.: Barriers and facilitators to implementing shared decision-making in clinical practice: Update of a systematic review of health professionals' perceptions. *Patient Education and Counselling* 73, 526–535 (2008)
- Li, Y.-H.: An empirical investigation on the determinants of E-procurement adoption in Chinese manufacturing enterprises. In: *15th International Conference on Management Science and Engineering*, pp. 32–37 (2008)
- Liang, T.-P., Huang, C.-W., Yeh, Y.-H., Lin, B.: Adoption of mobile technology in business: a fit-viability model. *Industrial Management and Data Systems* 107, 1154–1169 (2007)
- Lin, H.-F.: Predicting consumer intentions to shop online: An empirical test of competing theories. *Electronic Commerce Research and Applications* 6, 433–442 (2008)
- Mallat, N.: Exploring consumer adoption of mobile payments—A qualitative study. *The Journal of Strategic Information Systems* 16, 413–432 (2007)
- Mallat, N., Rossi, M., Tuunainen, V.K., Oorni, A.: An empirical investigation of mobile ticketing service adoption in public transportation. *Pers Ubiquit. Comput.* 12, 57–65 (2008)
- Meuter, M.L., Bitner, M.J., Ostrom, A.L., Brown, S.W.: Choosing among alternative service delivery modes: An investigation of customer trial of self-service technologies. *Journal of Marketing* 69, 61–83 (2005)
- Moore, G.C., Benbasat, I.: Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation. *Information Systems Research* 2, 192–222 (1991)
- NPCI (2012), <http://www.npci.org.in/aboutimps.aspx> (accessed on: October 20, 2012)
- Ramamurthy, K., Sen, A., Sinha, A.P.: An empirical investigation of the key determinants of data warehouse adoption. *Decision Support Systems* 44, 817–841 (2008)

- Richardson, J.W.: Technology adoption in Cambodia: Measuring factors impacting adoption rates. *Journal of International Development* 23, 697–710 (2009)
- Rogers, E.M.: *Diffusion of Innovations*, 5th edn. The Free Press, New York (2003)
- Schierz, P.G., Oliver Schilke, O., Wirtz, B.W.: Understanding consumer acceptance of mobile payment services: An empirical analysis. *Electronic Commerce Research and Applications* 9, 209–216 (2010)
- Shih, H.-P.: Continued use of a Chinese online portal: an empirical study. *Behaviour and Information Technology* 27, 201–209 (2008)
- Shih, Y.-Y., Fang, K.: The use of a decomposed theory of planned behavior to study Internet banking in Taiwan. *Internet Research* 14, 213–223 (2004)
- Shin, D.-H.: MVNO services: Policy implications for promoting MVNO diffusion. *Telecommunications Policy* 34, 616–632 (2010)
- Siau, K., Shen, Z.: Building customer trust in mobile commerce. *Communications of the ACM* 46, 91–94 (2003)
- Sia, C.-H., Teo, H.-H., Tan, B.C.Y., Wei, K.-K.: Effects of environmental uncertainty on organizational intention to adopt distributed work arrangements. *IEEE Transactions on Engineering Management* 51, 253–267 (2004)
- Slyke, C.V., Lou, H., Day, J.: The impact of perceived innovation characteristics on intention to use groupware. *Information Resource Management Journal* 15, 5–12 (2002)
- South Indian Bank (2012), <http://www.southindianbank.com/UserFiles/FAQ-IMPS.pdf> (accessed on: October 20, 2012)
- Tanakinjal, G.H., Deans, K.R., Gray, B.J.: Third Screen Communication and the Adoption of Mobile Marketing: A Malaysia Perspective. *International Journal of Marketing Studies* 2, 36–47 (2010)
- Tornatzky, L.G., Klein, K.J.: Innovation Characteristics and Innovation Adoption-Implementation: A Meta-Analysis of Findings. *IEEE Transactions on Engineering Management* 29, 28–43 (1982)
- Taylor, S., Todd, P.: Understanding information technology usage: a test of competing models. *Information Systems Research* 6, 144–176 (1995)
- Teo, T.S.H., Pok, S.H.: Adoption of WAP-enabled mobile phones among Internet users. *Omega* 31, 483–498 (2003)
- Vishwanath, A., Goldhaber, G.M.: An examination of the factors contributing to adoption decisions among late-diffused technology products. *New Media and Society* 5, 547–572 (2003)
- Ungan, M.: Factors affecting the adoption of manufacturing best practices. *Benchmarking: An International Journal* 11, 504–520 (2004)
- Wang, Y.-M., Wang, Y.-S., Yang, Y.-F.: Understanding the determinants of RFID adoption in the manufacturing industry. *Technological Forecasting and Social Change* 77, 803–815 (2010)
- Worster, A., Fan, J., Ismaila, A.: Understanding linear and logistic regression analyses, pedagogical tools and methods. *CJEM* 9, 111–113 (2007)
- Wu, J.-H., Wang, S.-C.: What drives mobile commerce?: An empirical evaluation of the revised technology acceptance model. *Information and Management* 42, 719–725 (2005)
- Yang, H.-J., Lay, Y.-L., Tsai, C.-H.: An implementation and usability evaluation of automatic cash-payment system for hospital. *Journal of Scientific and Industrial Research* 65, 485–494 (2006)
- Yiu, C.S., Grant, K., Edgar, D.: Factors affecting the adoption of internet banking in Hong Kong – implications for the banking sector. *International Journal of Information Management* 27, 336–351 (2007)