# Understanding Factors Affecting Consumer Adoption of Broadband in India: A Pilot Study

Yogesh K. Dwivedi[1]*, Michael D. Williams[1], Banita Lal[1], Vishanth Weerakkody[2] and Sneha Bhatt[3]

**ABSTRACT**

*The aim of this study is to provide an initial understanding of the factors affecting the adoption of broadband Internet in a developing country context, in this instance India. In order to achieve this aim, this study identified and examined various attitudinal, normative and control factors and their possible influence upon broadband adoption. The data on these variables was collected using a survey approach. The findings of this paper suggest that relative advantage, hedonic outcomes and cost are significant factors for explaining consumers' behavioral intentions to adopt broadband in India. The paper also outlines the limitations of this study, and directions for future research.*

***Keywords:*** India, broadband, adoption, consumer, survey

## 1. Introduction

An analysis of the literature on broadband adoption and diffusion suggests that although both macro (Choudrie and Lee, 2004) and micro level (Choudrie and Dwivedi, 2006ab) studies have been conducted in order to understand the deployment of broadband in the developed world and leading countries such as South Korea, significantly fewer studies have focused upon this issue within the developing country context (Dwivedi et al. 2006a). The reason for this lack of broadband adoption studies could be accredited to the late rollout of broadband services, slow infrastructure development, low tele-density and slow rate of adoption. However, since there is scarce research evidence that illustrates the current state of broadband deployment and diffusion amongst developing countries (Dwivedi et al. 2006a), such potential explanations require further empirical support. Considering that developing countries such as India are already far behind in terms of broadband adoption and diffusion in comparison to other nations, it is important to instigate research in this area which may help to accelerate the process of consumer adoption within India.

Since the deployment and adoption of broadband is still in its embryonic stage in India, it was considered to provide an appropriate context for understanding the drivers and barriers of consumer adoption of broadband from a developing nation's perspective. A recently published report highlighted the problem of slow broadband adoption/low penetration in India. The report stated that "*There is tremendous enthusiasm amongst the dial-up users and an estimated 60% of users regularly access the Internet via the country's more than 10,000 cybercafes. But when it comes to high-speed broadband access, there is reluctance,*

[1] Center for E-Business Research, School of Business & Economics, Swansea University, UK
* *Corresponding Author:* (Email: ykdwivedi@gmail.com, Phone: +44-1792602340; Fax: +44 -1792 295626)
[2] Department of Information Systems & Computing, Brunel University, Uxbridge, UK
[3] Mumbai, India

*especially within the corporate sector, and the take-up rate has been slow. By early 2005 there were about 700,000 broadband subscribers – a penetration of less than 0.1%*" (Internet World Stat, 2006).

Given the situation of India in terms of its demography, telecommunication infrastructure and affordability of Internet by citizens, it was deemed that understanding factors including cost of Internet access and subscription and their impact on consumer adoption and usage may help to encourage further diffusion and management of high speed Internet. Therefore, the aim of this study was *to conduct a pilot study for understanding the factors affecting consumer adoption of broadband Internet in India*. Having introduced the topic of interest, this paper now proceeds to provide a brief discussion on the theoretical basis for examining this topic in Section 2. Section 3 provides details of the research methods utilized within this study. The findings are presented in Section 4 and a discussion in Section 5. Finally, a conclusion including the contributions of the research is provided in Section 6.

## 2. Theoretical Basis

The theoretical constructs included in this study were adapted from Brown and Venkatesh (2005) and Dwivedi (2005). In this study it was postulated that the behavioral intentions (BI) to adopt broadband are determined by three types of constructs. These are: (1) attitudinal constructs (*relative advantage, utilitarian outcomes, hedonic outcomes, social outcomes and service quality*), which represent consumers' favorable or unfavorable evaluations of the behavior in question (i.e. adoption of broadband) (Brown and Venkatesh, 2005; Dwivedi, 2005; Rogers, 1995; Venkatesh and Brown, 2001); (2) normative constructs (*primary influence, work referents' influence and secondary sources' influence*), which represent the perceived social pressure upon consumers to perform the behavior in question (i.e. adoption of broadband) (Brown and Venkatesh, 2005; Dwivedi, 2005; Venkatesh and Brown, 2001), and (3) control constructs (*knowledge, self-efficacy, perceived ease of use, perceived ease of subscribing broadband, cost, declining cost, facilitating conditions resources and perceived lack of needs*), which represent the perceived control over the personal or external factors that may facilitate or constrain the behavioral performance of consumers (Brown and Venkatesh, 2005; Dwivedi, 2005; Rogers, 1995; Venkatesh and Brown, 2001). It was found that constructs such as *relative advantage, utilitarian outcomes, hedonic outcomes, primary influence, secondary influence, self-efficacy* and *facilitating conditions resources* significantly influenced BI to adopt broadband within UK households (Dwivedi, 2005). However, other constructs have yet to be applied in order to examine broadband adoption, which have been successfully employed to investigate PC adoption in the US (Brown and Venkatesh, 2005; Venkatesh and Brown, 2001). Since no prior research has investigated the adoption of broadband within India, it was decided that all the possible and appropriate constructs from previous studies would be included at the pilot stage of this research. Table 1 defines the constructs included in this study.

**Table 1:** Definition of factors included to study broadband adoption in India
*(Source Dwivedi 2005; 2007; Dwivedi et al. 2007)*

| Constructs | Definitions of constructs and sources |
|---|---|
| Behavioural Intention | Behavioural Intention (BI) is defined as a consumer's intention to subscribe (or intention to continue the current subscription) and makes use of Broadband Internet in the future (Brown and Venkatesh, 2005; Venkatesh & Brown, 2001). |
| Relative Advantage | It is defined as the degree to which broadband Internet is perceived as being better than its predecessor narrowband Internet (Rogers, 1995). |
| Utilitarian Outcomes | It is the extent to which broadband internet usage enhances the effectiveness of household activities such as, undertaking office work at home, children's homework, information or product search and purchase and home business (Brown & Venkatesh, 2005; Venkatesh & Brown, 2001). |

| | |
|---|---|
| Hedonic Outcomes | Hedonic outcomes are defined as the pleasure derived from the consumption, or use of broadband Internet. For example, the entertainment potential of the Internet via offerings such as, online radio, streaming audio and video, electronic greetings, online games, online casino (Brown & Venkatesh, 2005; Venkatesh & Brown, 2001). |
| Social Outcomes | The increase in prestige that coincides with the subscription of broadband for home use (Venkatesh and Brown 2001). |
| Service Quality | Service quality can be defined as the perceived quality of service a consumer obtained or is obtaining from the current Internet service providers. Service quality is measured in terms of, speed of connection and security problem with Internet connections, virus and popup problems with connection and customer support obtained from the ISP providers (DeLone and McLean, 2003; Parasuraman *et al*, 1991; Parasuraman *et al*, 1991). |
| Primary influences | Primary influences are defined as the perceived influences from friends and family to subscribe to and use (or not to subscribe and use) broadband Internet services (Brown & Venkatesh, 2005; Venkatesh & Brown, 2001). |
| Workplace referents' influences | The extent to which co-workers influence behaviour (Brown & Venkatesh, 2005). |
| Secondary Influences | Secondary influences are defined as the perceived influence of information from secondary sources such as advert and news on TV, newspapers to subscribe and use (or not to subscribe and use) broadband Internet services (Brown & Venkatesh, 2005; Rogers, 1995; Venkatesh & Brown, 2001). |
| Perceived Knowledge | Knowledge is defined as the perceived level of knowledge about broadband Internet, its risks and benefits (Rogers, 1995; Venkatesh & Brown, 2001). |
| Self-efficacy | Self-efficacy is defined as the perceived ability or skill to operate computers and the Internet (narrowband or broadband) without the assistance of others (Dwivedi, 2005). |
| Perceived Ease of Use | The degree to which using the PC is free from effort (Venkatesh and Brown 2001). |
| Perceived Ease of Obtaining Subscription | The degree to which subscribing broadband is free from effort. |
| Facilitating Conditions Resources | Facilitating conditions resources is defined as the perceived level of resources when subscribing to broadband (Venkatesh & Brown, 2001). |
| Cost | The extent to which the current cost of a broadband subscription is too high (Venkatesh and Brown 2001). |
| Declining cost | The extent to which the cost of broadband subscription is decreasing in such a way that it inhibits adoption (Venkatesh and Brown 2001). |
| Perceived lack of Needs | The extent to which the respondents feel that they do not have need of subscribing broadband |

## 3. Research Methodology

The survey was considered to be a suitable research method for data collection in this study (Choudrie and Dwivedi, 2005). A self-administered questionnaire was the primary survey instrument for data collection, and was selected because it addresses the issue of reliability of information by reducing and eliminating differences in the way that the questions are asked, and how they are presented (Fowler, 2002). Furthermore, questionnaires facilitate the collection of data within a short period of time from the majority of respondents, which was a critical issue for this research (Fowler, 2002). Fowler (2002) has suggested that, "if one is going to have a self-administered questionnaire, one must reconcile oneself to closed questions, which can be answered by simply checking a box or circling the proper response from a set provided by the researcher" (Fowler, 2002). Taking this into consideration, multiple and closed questions were mainly included in the questionnaire. The literature review provided an initial understanding of broadband adoption and subsequently provided the basis for the development of a draft questionnaire. The

final questionnaire consisted of 14 questions. All 14 questions were close-ended, multiple and Likert scale type in nature. The Likert scale type questions were adapted from Dwivedi et al (2006b) and Choudrie and Dwivedi (2006b) and the demographic categories were adapted from Choudrie and Dwivedi (2006a). Due to the uncertainty regarding the number of customers using the broadband facility, the snowball (or chain) sampling technique (Dwivedi et al. 2006a; Dwivedi et al. 2007) was employed for generating respondents for the survey. In order to identify the initial respondents who had an Internet connection, one of the researchers located in Mumbai, India approached friends and colleagues who possessed a broadband connection at home. Email was used to distribute and receive the completed questionnaires. In addition, respondents were requested to recommend other friends and family members who also had Internet connections at home, so as to increase the sample size. This strategy led to the questionnaire being administered to a total of 100 broadband users during the periods of August and November 2006. All the respondents who replied were located mainly in Mumbai, India. Of the 100 questionnaires administered, 48 respondents returned completed and usable questionnaires. Thus, a response rate of 48% was achieved.

The initial stage of data analysis involved checking the responses and providing a unique identification number to each response. Using SPSS (version 14), descriptive statistics (i.e. frequencies, percentage and tables) were generated and reliability tests and regression analysis were conducted in order to analyze and present the research data obtained from the questionnaires.

## 4. Research Findings

Of the 48 respondents, only 77.3 percent represented the adopters of broadband and the remaining 22.7 percent were the non-adopters. The non-adopters of broadband included respondents who accessed the Internet via narrowband (dial-up) at home and those who did not have Internet access at all.

### *4.1 Reliability Test*

Cronbach's coefficient alpha values were estimated to examine the internal consistency of the measure (Table 2). Cronbach's $\alpha$ varied between 0.97 for the behavioural intentions and 0.51 for the facilitating conditions resources constructs. Both utilitarian outcomes and perceived ease of use possessed a reliability value of 0.81. Two constructs, namely perceived ease of obtaining subscription and secondary sources influence, had Cronbach's $\alpha$ at 0.88, and for relative advantage and perceived lack of needs constructs the values of alpha were 0.62 and 0.58 respectively. For all the other constructs, the alpha values are illustrated in Table 2. Hinton et al. (2004) have suggested four cut-off points for reliability, which includes excellent reliability (0.90 and above), high reliability (0.70-0.90), moderate reliability (0.50-0.70) and low reliability (0.50 and below). The aforementioned values suggest that of the 17 constructs, 14 possessed high reliability and the remaining three illustrated moderate reliability. None of the constructs demonstrated low reliability (Table 2). The high Cronbach's $\alpha$ values for all the constructs implies that they were internally consistent. This, in turn, means that all items of each construct measured the same content universe (i.e. construct). For example, all items of BI measured the same content universe of behavioural intention. Similarly, all items of UO measured the content universe of the utilitarian outcomes construct. In brief, the higher the Cronbach's $\alpha$ value of a construct, the higher the reliability is of it measuring the same construct.

### *4.2 Descriptive Statistics: Attitudinal Factors*

Table 3 presents the means and standard deviations of the items related to all five attitudinal constructs included in the study for the purpose of measuring consumers' perceptions about broadband adoption. The means and standard deviations of aggregated measures for all the five constructs are also illustrated in Table 3. A strong agreement was made for the relative advantage with highest average score of aggregate measure (M = 5.99, SD = 0.75) amongst attitudinal category where item RA4 scored the maximum (M = 6.21, SD = .922) and item RA3 scored the minimum (M = 5.63, SD = 1.18). The respondents also agreed strongly for all of the items of the utilitarian construct, where item UO1 scored the maximum (M = 6.29,

SD = .80) and minimum (M = 4.65, SD = 1.16) for item UO10 with the second highest average score of aggregate measure (M = 5.45, SD = .65) amongst attitudinal category. A moderately strong agreement was also made for the hedonic outcomes (M = 3.82, SD = .92) and service quality (M = 4.69, SD = 1.06) constructs by the survey respondents. The importance of social outcomes was comparatively less agreed upon with a lowest average mean score of 1.81 and standard deviations of 1.2 (Table 3).

**Table 2:** Reliability of Measurements (N=237)

| Constructs | Number of Items | Cronbach's Alpha (α) |
|---|---|---|
| BI: Behavioural Intentions | 3 | 0.97 |
| RA: Relative Advantage | 4 | 0.62 |
| UO: Utilitarian Outcomes | 12 | 0.81 |
| HO: Hedonic Outcomes | 9 | 0.85 |
| SO: Social Outcomes | 3 | 0.86 |
| PI: Primary Influence | 4 | 0.92 |
| WR: Work Referents' Influences | 2 | 0.95 |
| SI: Secondary Sources' Influence | 4 | 0.88 |
| PES: Perceived Ease of Obtaining Subscription | 4 | 0.88 |
| PEOU: Perceived Ease of Use | 3 | 0.81 |
| SE: Self-efficacy | 3 | 0.87 |
| FCR: Facilitating Conditions Resources | 2 | 0.51 |
| SF/C: Cost | 2 | 0.86 |
| DC: Declining Cost | 3 | 0.92 |
| PK: Perceived Knowledge | 3 | 0.87 |
| PLN: Perceived Lack of Need | 4 | 0.58 |
| SQ: Service Quality | 4 | 0.74 |

**Table 3:** Descriptive statistics of attitudinal factors and their items

| Factors/Detailed Factors | | Mean | Std. Deviation | Ranking |
|---|---|---|---|---|
| Relative Advantage (RA) | SCALE_RA | 5.99 | .745 | 1 |
| | RA1 | 6.04 | 1.220 | |
| | RA2 | 6.08 | 1.007 | |
| | RA3 | 5.63 | 1.178 | |
| | RA4 | 6.21 | .922 | |
| Utilitarian Outcomes (UO) | SCALE_UO | 5.45 | .651 | 2 |
| | UO1 | 6.29 | .798 | |
| | UO2 | 5.88 | 1.160 | |
| | UO3 | 5.73 | 1.125 | |
| | UO4 | 4.92 | 1.302 | |
| | UO5 | 4.78 | 1.312 | |
| | UO6 | 5.98 | .863 | |
| | UO7 | 4.88 | 1.084 | |

| | | | | |
|---|---|---|---|---|
| | UO8 | 5.74 | .920 | |
| | UO9 | 5.24 | 1.392 | |
| | UO10 | 4.65 | 1.158 | |
| | UO11 | 4.94 | 1.227 | |
| | UO12 | 5.71 | 1.220 | |
| Hedonic Outcomes (HO) | SCALE_HO | 3.82 | .921 | 4 |
| | HO1 | 3.77 | 1.462 | |
| | HO2 | 4.28 | 1.556 | |
| | HO3 | 3.08 | 1.569 | |
| | HO4 | 3.02 | 1.700 | |
| | HO5 | 3.15 | 1.458 | |
| | HO6 | 1.81 | 1.024 | |
| | HO7 | 5.17 | 1.028 | |
| | HO8 | 5.06 | 1.040 | |
| | HO9 | 4.79 | 1.220 | |
| Social Outcomes (SO) | SCALE_SO | 1.81 | 1.201 | 5 |
| | SO1 | 2.10 | 1.588 | |
| | SO2 | 1.75 | 1.246 | |
| | SO3 | 1.58 | 1.217 | |
| Service Quality (SQ) | SCALE_SQ | 4.69 | 1.060 | 3 |
| | SQ1 | 4.81 | 1.581 | |
| | SQ2 | 4.62 | 1.464 | |
| | SQ3 | 4.45 | 1.533 | |
| | SQ4 | 5.08 | .997 | |

### *4.3 Descriptive Statistics: Normative Factors*

Table 4 presents the means and standard deviations of the items and aggregated measures related to all three normative constructs included in the study to measure consumers' perceptions regarding broadband adoption. Amongst the normative constructs, both primary influence ($M$ = 4.68, $SD$ = 1.34) and work referents' influences ($M$ = 4.68, $SD$ = 1.55) rated above average and was agreed upon more strongly than secondary influence, which was rated slightly lower than the average score of primary influence ($M$ = 4.03, $SD$ = 1.23) (Table 4).

### *4.4 Descriptive Statistics: Control Factors*

Table 5 presents the means and standard deviations of the items and aggregated measures related to all eight control constructs included in the study to measure consumers' perceptions regarding broadband adoption. Self-efficacy was rated stronger ($M$ = 6.01, $SD$ = .936) than the other control constructs, namely perceived ease of use ($M$ = 5.98, $SD$ = .72), facilitating conditions resources ($M$ = 5.74, $SD$ = .88), perceived knowledge ($M$ = 5.52, $SD$ = 1.14), perceived ease of obtaining subscription ($M$ = 4.90, $SD$ = 1.19), declining cost ($M$ = 4.54, $SD$ = 1.28), cost ($M$ = 4.15, $SD$ = 1.24) and perceived lack of needs ($M$ = 3.46, $SD$ = 1.15) (Table 5).

**Table 4:** Descriptive statistics of normative factors and their items

| Factors/Detailed Factors | | Mean | Std. Deviation | Ranking |
|---|---|---|---|---|
| Primary Influence (PI) | FAC_PI | 4.68 | 1.343 | 1 |
| | PI1 | 4.85 | 1.414 | |
| | PI2 | 4.85 | 1.532 | |
| | PI3 | 4.62 | 1.328 | |
| | PI4 | 4.38 | 1.688 | |
| Work Referents' Influences (WR) | FAC_WR | 4.68 | 1.551 | 1 |
| | WR1 | 4.62 | 1.582 | |
| | WR2 | 4.74 | 1.594 | |
| Secondary Sources' Influence (SI) | FAC_SI | 4.03 | 1.235 | 2 |
| | SI1 | 4.19 | 1.313 | |
| | SI2 | 4.27 | 1.455 | |
| | SI3 | 4.04 | 1.520 | |
| | SI4 | 3.54 | 1.584 | |

**Table 5:** Descriptive statistics of control factors and their items

| Factors/Detailed Factors | | Mean | Std. Deviation | Ranking |
|---|---|---|---|---|
| Facilitating Conditions Resources (FCR) | FAC_FCR | 5.74 | .880 | 3 |
| | FCR1 | 5.74 | 1.010 | |
| | FCR2 | 5.79 | 1.141 | |
| Perceived Ease of Use (PEOU) | FAC_PEOU | 5.98 | .719 | 2 |
| | PEU1 | 6.00 | .715 | |
| | PEU2 | 5.88 | .937 | |
| | PEU3 | 6.06 | .861 | |
| Perceived Ease of Obtaining Subscription (PES) | FAC_PES | 4.90 | 1.185 | 5 |
| | PES1 | 4.82 | 1.386 | |
| | PES2 | 4.91 | 1.361 | |
| | PES3 | 5.20 | 1.276 | |
| | PES4 | 4.70 | 1.459 | |
| Cost (C) | FAC_SFC | 4.15 | 1.238 | 7 |
| | C1 | 4.15 | 1.255 | |
| | C2 | 4.15 | 1.384 | |
| Declining Cost (DC) | FAC_DC | 4.54 | 1.286 | 6 |
| | DC1 | 4.38 | 1.299 | |
| | DC2 | 4.50 | 1.473 | |
| | DC3 | 4.75 | 1.391 | |
| Perceived Knowledge (PK) | FAC_PK | 5.52 | 1.140 | 4 |

| | | | | |
|---|---|---|---|---|
| | PK1 | 5.25 | 1.345 | |
| | PK2 | 5.69 | 1.307 | |
| | PK3 | 5.63 | 1.196 | |
| Self-efficacy (SE) | FAC_SE | 6.01 | .936 | 1 |
| | SE1 | 6.00 | 1.031 | |
| | SE2 | 6.02 | .978 | |
| | SE3 | 6.00 | 1.130 | |
| Perceived Lack of Needs (PLN) | FAC_PLN | 3.46 | 1.147 | 8 |
| | PLN1 | 2.67 | 1.883 | |
| | PLN2 | 3.44 | 1.773 | |
| | PLN3 | 3.72 | 1.772 | |
| | PLN4 | 4.17 | 1.539 | |

### *4.5 Descriptive Statistics: Behavioural Factors*

Table 6 presents the means and standard deviations of the items related to both the behavioural constructs included in the study to measure consumers' perceptions regarding broadband adoption. The means and standard deviations of aggregated measures for both the constructs are also illustrated in this table. The respondents showed strong agreement for all of the items of the behavioural intentions (BI2 and BI1), as the mean score varied between 5.96 (SD=.93) and 5.83 (SD=1.11) (Table 6), with an average score of 5.90 (SD=1.02) (Table 6).

**Table 6:** Descriptive statistics of behavioural intention factor and its items

| Factors/Detailed Factors | | Mean | Std. Deviation |
|---|---|---|---|
| Behavioural Intention (BI) | FAC_BI | 5.90 | 1.024 |
| | BI1 | 5.83 | 1.117 |
| | BI2 | 5.96 | .932 |
| | BI3 | 5.92 | 1.069 |

### *4.6 Regression analysis: Influence of Independent Variables on Behavioural Intentions (BI) to Adopt Broadband*

The regression analysis was performed with behavioural intentions as the dependent variable and a total of 16 variables including relative advantage, utilitarian outcomes, hedonic outcomes, social outcomes, service quality, primary influence, work referent's influence, secondary influence, facilitating conditions resources, perceived ease of use, perceived ease of obtaining subscription, cost, declining cost, perceived knowledge, self-efficacy and perceived lack of needs as the predictor variables. A total of 48 cases were analyzed. From the analysis, a significant model emerged (See Table 7). The adjusted R square was 0.491. Only three predictor variables included in the analysis were found to be significant (Table 8). These included relative advantage ($\beta = .28$, $p = .000$), Cost ($\beta = .24$, $p = .011$) and hedonic outcomes ($\beta = .159$, $p = .017$). All the other predictor variables were not found to be significant (See Table 8). As illustrated in Table 8, the constructs are arranged according to their size of $\beta$ values in decreasing order. The size of $\beta$ suggests that the relative advantage construct had the largest impact in the explanation of variations of BI. This was followed by the cost and then hedonic outcomes constructs` (See Table 8).

**Table 7:** ANOVA

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 20.183 | 3 | 6.728 | 10.017 | .000(c) |
| Residual | 16.790 | 25 | .672 | | |
| Total | 36.973 | 28 | | | |

[c]Predictors: (Constant), RA, COST, HO

**Table 8:** Regression analysis: coefficients (Dependent variable: behavioural intentions)

| | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | 2.546 | 1.633 | | 1.559 | .132 |
| RA | .576 | .254 | .329 | 2.270 | .032 |
| COST | -.418 | .131 | -.448 | -3.181 | .004 |
| HO | .471 | .170 | .399 | 2.777 | .010 |
| UO | -.008(c) | -.049 | .961 | -.010 | .802 |
| SO | -.180(c) | -1.334 | .195 | -.263 | .966 |
| PI | .064(c) | .421 | .677 | .086 | .818 |
| WR | .063(c) | .433 | .669 | .088 | .883 |
| SI | .068(c) | .458 | .651 | .093 | .842 |
| FCR | -.135(c) | -.696 | .493 | -.141 | .496 |
| PEU | .154(c) | 1.049 | .305 | .209 | .841 |
| PES | .093(c) | .625 | .538 | .127 | .836 |
| DC | .037(c) | .256 | .800 | .052 | .897 |
| PK | .208(c) | 1.252 | .222 | .248 | .644 |
| SE | -.037(c) | -.262 | .795 | -.053 | .929 |
| PLN | .137(c) | .952 | .351 | .191 | .881 |
| SQ | .171(c) | 1.143 | .264 | .227 | .802 |

## 5. Discussion

The internal consistency of measures was assessed using a reliability test, in the form of Cronbach's α. For an exploratory or pilot study, it is suggested that reliability should be equal to or above 0.60 (Straub et al. 2004). Reliability, or the Cronbach's α value, of the constructs in this research varied between 0.51 and 0.97, and only two constructs possessed reliability slightly below the recommended level of .60 (Table 2). This means that all but two constructs possessed reliability values above the minimum recommended level (Table 2). This suggests that the measures of this study demonstrated an appropriate level of internal consistency. Previous studies have suggested the significant role of attitudinal factors such as relative advantage, utilitarian outcomes, hedonic outcomes and service quality on influencing consumers' behavioral intentions to adopt personal computers (Brown and Venkatesh, 2005) and broadband (Dwivedi, 2005; Dwivedi at al., 2006b). Consistently, the outcome of this pilot study suggests that the two attitudinal variables -relative advantage and hedonic outcomes- were significant in terms of influencing consumers' behavioral intentions to adopt broadband within India. However, in contrast to previous findings (Brown and Venkatesh, 2005; Dwivedi, 2005; Dwivedi at al., 2006b) all three normative constructs were found to be insignificantly related to behavioral intentions. Of the control category, only one construct -cost- was significantly related to BI, which is not consistent with the findings of previous studies (Brown and

Venkatesh, 2005; Dwivedi, 2005; Dwivedi at al., 2006b). However, the influence of all other control constructs was non-significant on BI.

The predictive power of the regression model of this research can be compared to the guiding model of broadband adoption (Dwivedi, 2005). The comparison of a previous study (Dwivedi, 2005) for the adjusted $R^2$ obtained for behavioral intention in both the studies clearly demonstrates that the adoption model of this research performed as well as the model in the previous study (Dwivedi, 2005). With regards to the behavioral intention value of the adjusted $R^2$ reported in Dwivedi (2005) study which was 0.43, the adjusted $R^2$ for this study was found to be 0.49, which suggests the appropriate level of explained variance. This means that the independent variables considered in this study are important for understanding consumers' behavioral intention to adopt broadband in India.

### *5.1 Implications*

The analysis of the empirical data derived from the survey of broadband consumers revealed many lessons that will be helpful to Internet Service Providers (ISPs) or broadband service providers and policymakers seeking to encourage consumer adoption of broadband in India. These lessons, implications and theoretical contributions are summarized below. As discussed above, empirical data has suggested that relative advantage, hedonic outcomes and cost are factors that significantly affect consumers' intentions to adopt broadband. These findings extend the current body of knowledge within the area of consumer adoption of broadband, since these factors have previously not been examined in the literature to explain the adoption of subscription-based technologies such as broadband, within the context of developing countries such as India. Therefore, the theoretical contribution of this research is that it identifies and integrates the appropriate Information Systems literature in order to enhance the knowledge of technology adoption from the consumer perspective in the developing world.

The findings of this research generate a number of issues that may assist both policy makers and ISPs for understanding consumer adoption of broadband. By utilizing experience and research findings gained from developed world, policy makers may emphasize role of cost/price, content and last mile access for encouraging growth and diffusion of broadband in India. Our research confirms and strengthens the view that the factors such as cost, speed of connection and content with hedonic properties appropriate to apply for current management of broadband diffusion in India. As the findings suggest, two of the attitudinal factors are significant in explaining consumers' behavioral intentions to adopt broadband. This clearly suggests that efforts are required from both the policy makers and ISPs in India to develop and exploit this positive attitude towards broadband amongst consumers by making them aware about the benefits of broadband.

The cost of subscribing to broadband construct emerged as an important and significant factor in terms of influencing BI to adopt broadband. This has implications for both ISPs and policy makers. For instance, ISPs have to think about more consumer-centric services and alternative price plans so that all consumers who want to subscribe to broadband should be able to do so. Furthermore, policy makers have to provide alternative places for broadband access where lower income groups, or those who cannot afford it, can use it. This may help to develop positive attitudes towards broadband amongst consumers and increase their behavioral intentions to adopt broadband which may, subsequently, encourage the overall adoption of broadband within India.

## 6. Concluding Remarks

This study empirically examined the factors affecting the adoption of broadband Internet in a developing country by focusing upon India. The following conclusions can be drawn from this research and are based on the underlying research assumption made in Section 2. A total of 16 constructs (See Tables 2 and 8)

were expected to be correlated to the BI of consumers when adopting broadband Internet in India. Of these 16 constructs three, including relative advantage, hedonic outcomes and cost, significantly correlated to the BI of consumers. In terms of the size of the effect of these three constructs that contributed significantly to behavioral intentions, the relative advantage construct had the largest impact in the explanation of variations of BI. This was followed by the cost and hedonic outcomes constructs. As broadband technologies enable a range of communication and Internet services, studying individuals from India provides a useful starting point for understanding the adoption of broadband in developing countries. This research presents one of the initial efforts towards understanding the adoption behaviour of Internet consumers outside of the developed country perspective. The findings are specifically useful for ISPs and policy makers within India. Factors that are reported as being significant are of utmost importance and require attention in order to encourage the further adoption and usage of broadband Internet within the country.

## References


1. Brown, S., & Venkatesh, V. (2005). Model of adoption of technology in households: A baseline model test and extension incorporating household life cycle. *MIS Quarterly*, 29, (3), 399-426.
2. Choudrie, J., & Dwivedi, Y. K. (2006a). Examining the socio-economic determinants of broadband adopters and non-adopters in the United Kingdom**.** *Proceedings of the 39th Annual Hawaii International Conference on System Sciences*, January 4-7, IEEE Computer Society Press, 10 pages**.**
3. Choudrie, J., & Dwivedi, Y. K. (2006b). Investigating factors influencing adoption of broadband in the household. *Journal of Computer Information Systems*, 46, (4), 25-34.
4. Choudrie, J., & Dwivedi, Y. K. (2005). Investigating the research approaches for examining the technology adoption in the household. *Journal of Research Practice,* 1, 1, D1, 1-12, available at http://jrp.icaap.org/content/v1.1/choudrie.pdf.
5. Choudrie, J., & Lee, H. (2004). Broadband development in South Korea: institutional and cultural factor. *European Journal of Information Systems*, 13, (2), 103-114.
6. Dwivedi, Y.K., Khan, N., & Papazafeiropoulou, A. (2007). Consumer adoption and usage of broadband in Bangladesh. *Electronic Government: An International Journal*, 4, (3), 299–313.
7. Dwivedi, Y.K. (2007). Consumer Adoption and Usage of Broadband. Hershey, PA, USA: IRM Press-IGI Global.
8. Dwivedi, Y.K., Khoumbati, K., Williams, M.D., & Lal, B. (2007). Factors affecting consumers' behavioural intention to adopt broadband in Pakistan. *Transforming Government People, Process and Policy*, 1, (3), 285-297
9. Dwivedi Y.K., Khan, N., & Papazafeiropoulou A. (2006a). Consumer Adoption and Usage of Broadband in Bangladesh. In the proceedings of the Twelfth Americas Conference on Information Systems, Acapulco, Mexico August 04th-06th 2006
10. Dwivedi, Y.K., Choudrie, J., & Brinkman, W.P. (2006b). Development of a survey instrument to examine consumer adoption of broadband. *Industrial Management and Data Systems,* 106, (5), 700-718.
11. Dwivedi, Y.K. (2005). Investigating Adoption, Usage and Impact of Broadband: UK Households, Unpublished PhD Thesis, DISC, Brunel University.
12. Fowler, F. J. Jr. (2002). Survey research methods. London: SAGE Publications Inc.,
13. Fridah M. W., Sampling in research. Available at: http://trochim.human.cornell.edu/tutorial /mugo/tutorial.htm Accessed 29th April 2004.
14. Hinton, P. R., Brownlow, C., McMurray, I., & Cozens, B. (2004). SPSS explained. East Sussex, England: Routledge Inc.,
15. Internet World Stat (2006). India: Internet Usage Stats and Telecommunications Market Report, Available at http://www.internetworldstats.com/asia/in.htm, Accessed 29 June 2007.
16. Rogers, E. M. (1995). Diffusion of innovations. New York: Free Press.
17. Straub, D. W., Boudreau, M-C, & Gefen, D. (2004). Validation guidelines for IS positivist research. *Communications of the Association for Information Systems,* 13, 380-427.
18. Venkatesh, V., & Brown, S. (2001). A longitudinal investigation of personal computers in homes: Adoption determinants and emerging challenges. *MIS Quarterly*, 25, (1), 71-102.

### *About the Authors*

*Yogesh Kumar Dwivedi* is a Lecturer in Information Systems at the School of Business and Economics, Swansea University, UK. He obtained his PhD entitled 'Investigating consumer adoption, usage and impact of broadband: UK households' and MSc in Information Systems from the School of Information Systems, Computing and Mathematics, Brunel University, UK. He also holds a BSc (Biology) from The University of Allahabad, India and an MSc (Plant Genetic Resources) from the Indian Agricultural Research Institute, Pusa Campus, New Delhi, India. His primary research interests focus upon the adoption and diffusion of ICTs in organisations and society. He is author of a forthcoming book '*Consumer Adoption and Use of Broadband*' (Publisher - IGI Global, Hershey, USA). He also co-edited a forthcoming handbook '*Handbook of Research on Global Diffusion of Broadband Data Transmission*' (Publisher - IGI Global, Hershey, USA). He has co-authored more than 40 papers in academic journals and international conferences and is a member of the editorial board/review board in a number of leading journals. He is also in the process of guest editing issues for three well respected international journals – *Information Systems Frontiers, Government Information Quarterly* and *Journal of Enterprise Information Management.*

*Michael Williams* is a Professor in the School of Business and Economics at Swansea University in the UK. He holds a BSc from the CNAA, an MEd from the University of Cambridge, and a PhD from the University of Sheffield. He has implemented, and evaluated information systems in domains including finance, telecommunications, manufacturing, and government, is the author of numerous refereed and invited papers, and has obtained external research funding from sources including the European Union, the Nuffield Foundation, and the Welsh Assembly Government. He currently serves as an invited member of the Project Expert Group for a European Union funded project examining transformative use of ICT.

*Banita Lal* is a Lecturer in the LIBT, Brunel University, Uxbridge, UK. She obtained her PhD entitled 'Homeworkers' Usage of Mobile Phones Across Work-Home Boundaries' and MSc in Information Systems from the School of Information Systems, Computing and Mathematics, Brunel University, UK.