

# **FACTORS AFFECTING BROADBAND INTERNET ADOPTION BY PAKISTANI HOUSEHOLD CONSUMERS: A LOGIT MODEL**

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## **Abstract**

*It may be argued that the general price-comparison based business model of Internet Service Providers may work in short term. However, to make such a model sustainable and to attract future customers a greater understanding of various factors affecting broadband internet adoption by consumers is essential. This paper examines a range of factors that possibly influence the Pakistani household consumers' behavioral intention to adopt broadband Internet. A survey research instrument examined the effect of six constructs (belonging to attitudinal, normative, control, and demographic categories) on consumers' behavioral intention to adopt broadband Internet. Results show that out of six constructs, five constructs significantly influenced the behavioral intention of consumers to adopt broadband Internet. Hedonic outcomes construct was found insignificant in influencing the behavioral intention of consumers to adopt broadband internet.*

**Keywords:** Broadband Internet, Broadband Adoption, Factors, Logistic Regression Analysis, Survey, Pakistan.

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### **Introduction**

Since the advent of the Internet, broadband is arguably the most significant technology that provides users not only fast and always-on access to the Internet but also a host of productivity benefits with new content, applications and services Sawyer et al., (2003); Van der Wee et al., (2014); Prieger, J. E. ,(2013); Australian Centre for Broadband Innovation, (2013). Broadband has been considered a vital element to enhance economic competitiveness and achieve sustained economic growth (Broadband Stakeholder Group, 2010; Crabtree, 2003; OECD Report ,2001) ;Oh, S. et al., 2003). Broadband adoption and use produce positive impacts on national economy and citizens lives, especially in the less-developed areas (Broadband Stakeholder Group, 2010; European Scrutiny Committee Report, 2006; Prieger ,2013).

In Pakistan, the continued efforts of Government of Pakistan and a highly competitive landscape of the Internet service industry have significantly enhanced affordable access to broadband by consumers (Manzoor, 2012). Since broadband inception in Pakistan, Pakistani ISPs most significant strategy to reach out new customers has been monthly pricing of broadband access (Manzoor, 2013).

The broadband subscription packages marketed by various ISPs in Pakistan focus on factors such as the Internet speed, limits on amount of downloaded data, monthly cost of broadband access (Manzoor, 2013). This price-focused strategy of ISPs to outperform the competition may be successful in short-term. Arguably, to achieve a long-term sustainable business model, ISPs need to gain a deeper understanding of factors other than the factors mentioned above. Such understanding will be helpful for ISPs in extending their future customer base. Therefore, the aim of this paper is to examine various attitudinal, normative, control, and demographic factors that can influence behavioral intention of Pakistani household consumers to

adopt broadband. This paper assumes that these factors affect behavioral intention of both current consumers of broadband and prospective consumers of broadband Internet.

There exist studies that examine the broadband diffusion and demand constraints on the broadband adoption (Anderson et al., 2002; Oh, S. et al., 2003; Stanton, 2004; Choudrie and Dwivedi, 2005; Choudrie and Dwivedi, 2004a). Conceptual models have been developed to understand the diffusion of broadband adoption (Choudrie and Dwivedi, 2004b; Dwivedi, 2005); Lin, and Wu, 2013a; Lin and Wu, 2013b; Kyriakidou et al., 2013) and research instruments (such as survey) have also been developed to test these models (Dwivedi et al., 2006).

After introduction, the paper will provide a discussion of constructs to be examined in Section 2. Research methodology adopted will be discussed in Section 3. Section 4 will provide the findings of the paper and Section 5 will provide discussion of these findings. A conclusion along with the contributions and limitations of this paper will be provided in Section 6. Section 6 will also provide a discussion of future research directions that can be drawn from this paper.

### **Literature Review**

#### **Constructs Influencing Broadband Adoption**

The constructs examined in this paper were adopted and modified from various broadband adoption studies (Dwivedi, 2005; Dwivedi et al., 2006; Choudrie and Dwivedi, 2006). The conceptual model proposed in this paper assumes that there exist several independent variables (belonging to attitudinal, normative, control, and demographic categories) that can possibly influence the dependent variable of the model i.e. "broadband adoption".

Table 1 provides definition, category, and source of each construct.

**Table 1:**

*Definition of the constructs included in this paper*

Constructs	Category	Definitions of constructs	Source of Constructs
Utilitarian Outcomes (UO)	Attitudinal	Extent to which users perceive broadband use enhances the effectiveness of their typical daily activities (such as homework, work-related activities etc.)	(Venkatesh and Brown, 2001) (Brown and Venkatesh, 2005)
Social influences (SI)	Normative	Extent of perceived influence on user from his/her family/friends to subscribe and use broadband internet.	(Taylor and Todd, 1995) (Venkatesh and Brown, 2001)
Self-efficacy (SE)	Control	User skill level to operate broadband internet independently (or at his own)	(Dwivedi, 2005)
Facilitating Conditions Resources (FCR)	Control	The consumer's perceived feeling of being resourceful when he/she subscribe and use broadband internet	(Venkatesh and Brown, 2001)
Hedonic Outcomes (HO)	Attitudinal	The extent of perceived pleasure consumer derives from the use of broadband Internet (such as games, fun and entertainment).	(Venkatesh and Brown, 2001) (Brown and Venkatesh, 2005)

### Discussion and Justification of Constructs

Utilitarian outcomes construct was proposed and validated by (Venkatesh and Brown, 2001) as a factor suitable for examining the adoption and subsequent use of technology by household consumer. (Broadband Stakeholder Group, 2010) suggests that broadband offers a more flexible lifestyle (e.g. by providing work at home opportunities, assisting children in their homework etc.). It is therefore expected that an increased perception of usefulness of broadband for activities of interest to consumers is likely to increase the future broadband adoption by household consumers.

Hedonic outcomes construct was proposed and validated by (Venkatesh and Brown, 2001) as a factor that influences personal computer (PC) adoption by household consumers. According to (Heijden, 2004), hedonic information systems encourage prolonged use by users. (Venkatesh and Brown, 2001) established the significance of entertainment in the decision making process of consumer to adopt a technology. By providing entrainment, a PC offers its users escape from reality and immerse in a new environment, a hedonic perspective (Foxall, 1992; Venkatesh and Brown, 2001). With the advent of the Internet, the entertainment capability of the Internet has significantly enhanced. This is so because PCs are now capable of providing a range of online entertainment opportunities. However, the extended entertainment capability of PC is severely hampered by the comparatively low speeds of early Internet access technologies such as dial-up. Broadband solved this speed problem by providing faster download speeds and streaming data capabilities thus creating more compelling and convenient environment for entertainment. (Lee et al., 2003; Lee and Choudrie 2002) suggested that PC Bang phenomenon was the most important factor behind faster broadband uptake in South Korea. Similarly, (Anderson et al., 2002) found that broadband users were more likely to use the Internet for entertainment and related activities as compared with their narrowband counterparts. Therefore, it is expected that user perception of broadband as a good medium of entertainment is likely to increase the broadband internet adoption by consumers.

Social influences construct was proposed and validated by (Venkatesh and Brown, 2001) and (Taylor and Todd, 1995) as a factor that influences forming of consumer perceptions of broadband adoption. This paper assumes a positive social influence, in the form of positive messages from consumer's social networks, will likely increase the behavioral intention of consumer to adopt broadband.

Choudrie and Lee( 2004) and Lee and Choudrie (2002) found that affordability of monthly cost of broadband internet access by the middle-income Korean households was one of the few significant factors that impacted increased broadband uptake in South Korea.

(Dwivedi et al., 2003) also found that high monthly cost of broadband was a major factor that inhibited broadband adoption by UK households. This paper, therefore, assumes that a perceived high cost of broadband access and perceived low resources will result in lower broadband adoption rates.

Use of broadband Internet is also dependent on the use of computer (PC) and the Internet. Therefore, it is expected that the requisite knowledge of PC and the Internet use combined with the ease or difficulty of use will likely impact the consumer broadband adoption. The “Ten Million Program” launched by South Korean government, in which PC and the Internet skills were provided to a large number of citizens, significantly boosted the internet adoption and added around 4 million new online users in country’s internet population (Choudrie and Lee, 2004; Lee and Choudrie 2002). This paper assumes that with higher level of basic PC and The Internet skills (the self-efficacy) the users will be more likely to adopt broadband.

Many models explain behavioral intention and technology adoption e.g. Decomposed Theory of Planned Behavior, Technology Acceptance Model, and Theory of Planned Behavior. The conceptual model of broadband adoption proposed in this paper is comparable to these models in the sense that many individual factors included in these models are part of the conceptual model of this. The aim is to investigate the collective impact of these factors on broadband adoption. The dependent variable of these models (i.e. broadband adoption) and structure of proposed model in this paper were similar.

### **Hypotheses**

The following are the hypotheses of this paper.

- H1: Utilitarian Outcomes (UO) significantly impact consumer’s behavioral intention to adopt broadband.
- H2: Hedonic Outcomes (HO) significantly impact consumer’s behavioral intention to adopt broadband.

- H3: Social Influence (SI) significantly impact consumer's behavioral intention to adopt broadband.
- H4: Self-Efficacy (SE) significantly impact consumer's behavioral intention to adopt broadband.
- H5: Facilitating Conditions Resources (FCR) significantly impact consumer's behavioral intention to adopt broadband.
- H6: Age significantly affects consumer's behavioral intention to adopt broadband.
- H7: The proposed conceptual model of broadband adoption provides an appropriate level of explanation of variance in the consumer's behavioral intention to adopt broadband.

### **Research Methodology**

This paper adopted a survey approach to examine various constructs related to behavioral intention of consumers to adopt broadband. A survey was considered an appropriate choice for primary data collection in an exploratory research, such as this paper (Choudrie and Dwivedi, 2005). This is because studies of broadband adoption in developing countries are fairly limited. The survey instrument and questions were adopted and modified from (Dwivedi, 2005; Dwivedi et al., 2006; Choudrie and Dwivedi, 2006). First a draft questionnaire was prepared. The draft questionnaire was administered on 100 respondents selected from the population of household broadband Internet users from Karachi. A total of 55 replies were received. Majority of respondents validated the survey content, reported no issues in understanding questions and took an average of 15 minutes to complete the survey. Based on the feedback received from the respondents who completed the survey, minor changes were made to the questionnaire and a final survey was developed. The draft survey was utilized to confirm reliability of survey items and reliability level of all constructs was found acceptable according to criteria of (Hinton et al., 2004) and Cronbach's alpha varied between 0.879 and 0.911 for different constructs. The survey had two categories of questions. One category consisted of multiple-type questions that examined the

demographics of consumers. The second category consisted of Likert scale questions regarding various constructs that examined the behavioral intention of consumers to adopt or not adopt broadband.

Survey was distributed both through emails as well as hard copy. The survey was distributed to the households in various parts of Pakistan. Snowball sampling technique (Dwivedi et al., 2007a; Dwivedi et al., 2007b) was used due the uncertainty involved in identifying current consumers of broadband internet and the access to these customers was nomadic. Initial respondents of the study identified from various parts of Pakistan and they belonged to various sectors such as academia, government, private sector etc. These initial respondents referred to their own friends / relatives / colleagues. This strategy progressively increased the sample size (Ooi et al., 2011; Dwivedi et al., 2007a) and, during the period of June-December of 2013, 800 total number of broadband users completed the survey.

Out of the 800 questionnaires received, 358 were found complete and usable reaching a response rate of 45 percent which was comparable to response rates achieved in previous studies on broadband internet adoption (Dwivedi et al., 2007a; Dwivedi et al., 2007b; Ooi et al., 2011); Mugeni et al., 2012).

Fowler (2002) suggests that analysis plan should be a prerequisite for determining the sample size. This paper used logistic regression analysis technique to analyze the data. (Stevens, 1996) suggests that a sample size of above 300 should be enough to perform such statistical analysis with rigor.

### **Data analysis**

The dependent variable in this paper, the broadband adoption, was categorical in nature since it measured the behavioral intention of consumer to adopt broadband. This variable was represented by Yes (1 if consumer has broadband) and No (0 if consumer do not have

broadband. A linear probability model was not suitable for analysis in this case due to the fact that the probability values it predicts may go beyond 0,1 range. A logit model was more appropriate choice and it was therefore used to examine and estimate the factors that could possibly influence the consumers' behavioral intention to adopt broadband internet (Greene, 1997).

### Findings

Table 2 shows the breakdown of the Internet availability among the 358 respondents.

**Table 2:**

*Distribution of Respondents based internet use*

Total Respondents	358		
	Respondents with internet access at home		Respondents with no internet access at home
	308 (86%)		50 (14%)
	Respondents with broadband internet	Respondents with narrowband internet	
	67% (207)	33% (101)	

### Logistic Regression Analysis

Table 3 shows the dependent and independent (predictor) variables used in the logistic regression analysis performed in this paper.

**Table 3:**

*Dependent and Predictor Variables*

Dependent Variable	Predictor variables
broadband adoption	Utilitarian Outcomes (UO), Social Influence, Facilitating Conditions Resources (FCR), Self-efficacy (SE), Hedonic Outcomes (HO), Age

The model analyzed 358 cases and the model was found significantly reliable ( $\chi^2 = 101.453, p < .001$ ) (Table 4). The model was able to explain between 24.3 % and 33.2 % variation in consumer's behavioral intention to adopt broadband (Table 5). The model successfully predicted 86.2 5% of broadband adopters and 61.5 3% of non-broadband adopters. Overall, the model was able to produce 75.2 % of predictions accurately (Table 6).

**Table 4:**  
*Chi-square and Significance Statistics*

	<b>Chi-square</b>	<b>Df</b>	<b>Sig.</b>
Model	101.453	6	.000

**Table 5:**  
*Omnibus Tests of Model Coefficients*

<b>Step</b>	<b>-2 Log likelihood</b>	<b>Cox &amp; Snell R Square</b>	<b>Nagelkerke R Square</b>
1	358.010(a)	0.243	0.332

**Table 6:**  
*Model Summary*

<b>Observed</b>		<b>Predicted</b>		
		Broadband Adoption		Percentage Correct
		Yes	No	
Broadband Adopters and Non Adopters	No	85	58	61.5
	Yes	32	171	86.2
Overall Percentage				75.2

The model shows that out of six predictor variables, all variables (except hedonic outcomes variable) reliably predicted consumer's behavioral intention to adopt broadband. The values of coefficients of various predictor variables show that each unit increase in utilitarian outcomes (UO) and Facilitating Conditions Resources (FCR) results in an associated increase in the odds of consumer's behavioral intention to adopt broadband by a factor of 1.874 (B=0.634) and 1.782 (B= 0.573) respectively (Table 7). Therefore, utilitarian outcome (or usefulness of broadband) has maximum part in explaining actual behavioral intention to adopt broadband. The three other significant factors in explaining actual behavioral intention to adopt broadband are Self-efficacy (B= 0.351), Age (B= -0.291), and SI (B= 0.265) respectively.

**Table 7:**  
*Variables in the Equation*

	B	Wald	Df	Sig.	Exp(B)
UO	0.634	16.212	1	0.000	1.874
FCR	0.573	24.124	1	0.000	1.782
SE	0.351	5.223	1	0.026	0.698
AGE	-0.291	6.491	1	0.012	0.771
SI	0.265	8.561	1	0.004	0.791
HO	0.005	0.003	1	0.942	1.104
Constant	-4.431	14.231	1	0.000	0.014

### Discussion

The findings of the paper suggest that utilitarian outcomes, social influence, facilitating conditions resources and self-efficacy, and age are variables that directly affect behavioral intention of consumer's intention to adopt broadband. These findings are in line

with findings of (Venkatesh and Brown, 2001). However, the insignificance of hedonic outcomes as a predictor of consumer's behavioral intention to adopt broadband is in contrast with findings of (Venkatesh and Brown, 2001). One possible explanation of this non-significance of hedonic outcomes construct could be the restrictions imposed by governments on freeloading (or online sharing) of proprietary entertainment content from the Internet (Anderson, 2000; Bhattacharjee et al., 2003; Cowen, 2004; Premkumar, 2003). Since the advent of high-speed the Internet, freeloading of digital entertainment content has become a major concern for governments and regulators across the globe (Anderson, 2000; Cowen, 2004). Mlcakova and Whitley (2004) found that regulations do affect human behavior of online file sharing using peer-to-peer applications. Such restrictions are considered necessary to safeguard the entertainment industry but at the same time they are likely to reduce likelihood of consumer intention to use broadband as an entertainment medium.

The conceptual model of broadband internet adoption presented in this paper performed well as compared with previous studies on broadband internet adoption. The adjusted  $R^2$  for previous behavioral models varied between 0.32 (Davis et al., 1989) to 0.51 (Davis, 1989). The adjusted  $R^2$  for the model presented in this paper was found to be 0.345. It shows that the model presented in this paper was able to explain an appropriate and comparable level of variance in behavioral intention. That means that predictor variables considered in the model of this paper are significant in understanding consumer's behavioral intention to adopt broadband. Therefore, this study finds support for all the hypotheses presented in this paper are accepted.

### **Contributions to the Field**

The findings of this paper generate many issues related to consumer's broadband adoption. These issues are relevant to both the policy makers and ISPs and helpful to gain a deeper understanding of consumer's broadband adoption. For example, facilitating conditions

resources have been found as the second most important factor that affects consumer's behavioral intention to adopt broadband. This finding has significant implications for ISPs and policy makers. That means ISPs will need to shift their focus to customer-centric services and flexible pricing of broadband access in order to create a mass-market demand. This is an issue currently being emphasized in Pakistan (PTA, 2012). Policy makers need to come up with a strategy to provide affordable broadband access at alternative accessible places for low-income customer groups. This may help increase overall broadband adoption rate within Pakistani household consumers.

Significance of self-efficacy (SE) as a factor that affects consumer's behavioral intention to adopt broadband internet brings into focus few policy-related issues of broadband internet access such as the provision of PC and the Internet skills to the citizens of the country.

Significance of utilitarian outcomes (UO) as a factor that affects consumer's behavioral intention to adopt broadband attests the need to provide more integrated content and applications that consumers could utilize for various purposes. A small number of consumers with high household income may not opt for broadband Internet use because of lack of appropriate compelling content. Therefore, ISPs also need to make this integrated content and applications apparent to not only the ordinary public but also to the wealthy individuals. ISPs can possibly do it by offering differential pricing plans and segmented broadband subscription packages according to the consumers' income level and needs. These packages may assist consumers of both high and low-income groups in determining the visible benefits of broadband internet over narrowband. It would also give them additional reasons to adopt broadband internet.

Findings of this paper are helpful to provide a plausible explanation of slow uptake of broadband and to develop and

implement appropriate measures to increase broadband adoption in Pakistan. For example, this paper found a negative impact of age on consumer's behavioral intention to adopt broadband. This implies that with increasing age people are less likely to adopt broadband. There can be many reasons for this including lack of resources (such as income), lack of PC and the Internet skills, lack of awareness of potential benefits of broadband, etc. This finding represents a significant challenge for policy makers to implement ways to bring people in older age groups into broadband population.

### **Conclusions**

Six constructs (taken from attitudinal, normative, control, and demographic categories) were analyzed. All six constructs were expected to influence consumer's behavioral intention to adopt broadband within Pakistani households. All, except hedonic outcomes construct, were found to have significant impact on consumer's behavioral intention to adopt broadband. Quantitatively speaking, out of the five constructs that significantly influence consumers' behavioral intention to adopt broadband, utilitarian outcomes (UO) explained the largest variance while social influences (SI) explained the smallest variance. This paper is one of the initial studies that are part of a larger effort to understand the consumers' behavioral intentions for broadband adoption within Pakistani households.

### **Limitations of Research and Future Research Extensions**

This paper provides one of the initial findings that explain the consumers' behavioral intention for broadband adoption within Pakistani households. The findings are expected to change with increasing maturity of technology and consumers' experience of its use. Since the research was conducted in a limited time frame, it was not possible to capture the impact of time on consumers' broadband adoption behavior. A longitudinal research may have reinforced the findings of the paper by removing anomalies in results through

elimination of variables. This is a quantitative research and therefore limited in its ability to obtain an in-depth understanding of household broadband adoption that may have been achieved by a detailed qualitative research. The survey findings could have been strengthened by using detailed interviews with consumers. However, time and resource constraints didn't allow a mixed-method research. A future research direction is to examine the findings of this paper for the applicability of the results across other developing countries. Doing so would require a cross-cultural approach to understand broadband adoption.

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**Broadband Survey Questionnaire****UO**

UO1: Broadband can be useful to find educational materials and accessing library resources at home

UO2: Broadband can be useful for distance learning

UO3: Broadband can be helpful to perform work/job-related tasks at home

UO4: Broadband will help me communicate better via e-mail, chat, web cam

UO5: Broadband can help in performing personal and household activities, i.e. online shopping

UO6: Broadband can help in performing personal and household activities, i.e. information search

UO7: Broadband can be helpful to establish and operate a home business

UO8: Broadband can help children to do their homework

UO9: Subscribing to broadband is compatible with most aspects of my everyday life

UO10: Overall broadband will be useful to me and other members in the family

**SI**

SI1: TV and radio advertising encourages me to try broadband

SI2: Newspaper advertising encourages me to try broadband

**SE**

SE1: I would feel comfortable using the internet on my own

SE2: Learning to operate the internet is easy for me

SE3: I clearly understand how to use the internet

**FCR**

FCR1: My annual household income level is enough to afford subscribing to broadband

FCR2: It is not too costly to purchase a new computer or to upgrade my old computer

FCR3: It is not too costly for me to subscribe to broadband at its current subscription fee

FCR4: I would be able to subscribe to broadband if I wanted to.

**HO**

HO1: I will enjoy using broadband to listen to and download music

HO2: I will enjoy using broadband to watch to and download movies

HO3: I will enjoy using broadband to play online games

HO4: I will enjoy using broadband to play online gambling/casino