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# Broadband Adoption: A UK Residential Consumers Perspective

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## ABSTRACT

This paper aims to investigate the adoption of broadband in the context of the UK residential consumers. The objectives of this paper include: (i) to identify the factors affecting broadband adoption in households; (ii) to develop a model of broadband adoption (MBA); (iii) to discuss an appropriate research approach; and (iii) to present findings of an initial study to determine the factors responsible for the adoption and non-adoption of broadband in the UK. The theoretical aspect of the literature was based upon the *Decomposed Theory of Planned Behaviour* (Taylor and Todd 1995) and the *Model of Adoption of Technology in Households* (Venkatesh and Brown, 2001). The result of the undertaken study suggests that the factors driving consumers level of broadband adoption include: relative advantage, utility outcomes, and hedonic outcomes. The main factors for the non-adopters were identified to be: high costs and lack of needs. The gradual adoption of broadband by consumers is not only an industry concern, but a government aim as well. Therefore this research should offer a substantial contribution to all interested stakeholders including the ISPs and government.

## Keywords

Broadband, adoption, non-adoption, residential consumers

## INTRODUCTION

As the potential of advanced Internet services is becoming evident to various countries around the globe, the development of an IT infrastructure and the encouragement towards the growth and development of e-commerce and e-government services is becoming imperative. To be able to use the advanced Internet services efficiently the development of broadband is essential and is an initiative that governments and industries around the globe are currently striving for. Broadband technology is considered to be a 'silver bullet' for the Internet as it offers enhanced access and superior quality of content, applications and services. Currently, the diffusion of broadband technology is of immense interest to various stakeholders. Both governments and industries around the globe have been forced to examine and overcome the barrier of speed provided by narrowband technologies by developing an infrastructure such that a high-speed Internet service can be delivered to the end-users.

Although large-scale investments have been made by the telecommunication industries and governments in many countries towards the development of the 'last mile technologies' (i.e. broadband), the adoption of broadband amongst consumers is sluggish. Furthermore, the existing rates of broadband subscription adopters are decreasing in a number of countries. This finding provided the reasoning for this research to investigate the factors responsible for the slow and decreasing rates of adoption amongst the broadband residential consumers. It has been found that the majority of the research associated with the topic of broadband is exploratory in nature, mainly focusing on the usage of the technology and provides little insight into the determinants of consumer adoption or rejection (Stanton 2004). Furthermore, Stanton (2004) has called for future research that determines the drivers behind the decision to have broadband connections in the home. Therefore, this paper aims to investigate the adoption of broadband in the context of the UK residential consumers. The objectives includes (i) to identify the factors affecting broadband adoption in the households; (ii) to develop a model of broadband adoption (MBA); (iii) to discuss an appropriate research approach; and (iii) to present findings of first empirical study to determine factors responsible for adoption and non-adoption of broadband at consumer level.

Having introduced the topic of interest this paper now proceeds to offer a definition of 'broadband' and a brief discussion of the research undertaken on the diffusion of broadband. This is followed by a brief review of the various technology adoption models and theories. Thereafter, explanations related to the proposed model of broadband adoption are discussed, followed by a brief discussion of the proposed research method and tool for this research. Having conducted the initial survey the findings obtained from the analysis are then presented, which precede the information about the final data collection. Conclusions are subsequently provided.

## BACKGROUND

The term "broadband technology" embraces a variety of high-speed access technologies including ADSL (Asymmetric Digital Subscriber Line), cable modems, satellite, and Wi-Fi (Wireless Fixed) Networks. Broadband has no established definition and evolves across space and time (Sawyer et al. 2003). Given the variations in defining 'broadband', for the purpose of this research we follow the technology neutral definition suggested by the Broadband Stakeholder Group (2001). It defines broadband as 'always on access, at work, at home or on the move provided by range of fixed line, wireless and satellite technologies to progressively higher bandwidths capable of supporting genuinely new and innovative interactive content, applications and services and the delivery of enhanced public services' (BSG 2001).

Since we are concerned with consumers, it is worth differentiating consumers from users. According to Rice (1997) 'consumers' are those who pay for services and goods, while, 'users' are individual who are affected by or who affect the product or services or in other words users are those who use the product and services but do not pay for it (Rice 1997). For example, children as users use broadband to play online games and to undertake homework however they do not subscribe to it, since the parents pay for the subscriptions and termed as consumers.

When examining the deployment of broadband it was found that the research on the demand perspective is limiting. The adoption studies discussed henceforth mainly provide discussions of the macro factors that drive the success or slow uptake of broadband deployment. In an initial study of broadband deployment in South Korea, Lee et al. (2001, 2003) identified three major reasons that explained the high rate of broadband adoption in South Korea. Further research suggested six success factors are responsible for driving the high penetration rate of broadband within the South Korean residential consumers (Lee and Choudrie, 2002). To obtain a UK perspective Dwivedi et al. (2003) examined the Internet Service Providers' (ISPs) views on factors affecting broadband adoption in the UK. This exploratory study suggested that a *high price*, *lack of content*, and *lack of awareness* are the factors that are severely affecting the adoption of broadband amongst residential consumers. Other exploratory studies that have examined factors affecting the deployment of broadband in the various countries include Sweden (Shim et al. 2003), Australia and Canada (Gardner 2003; Chang et al. 2003).

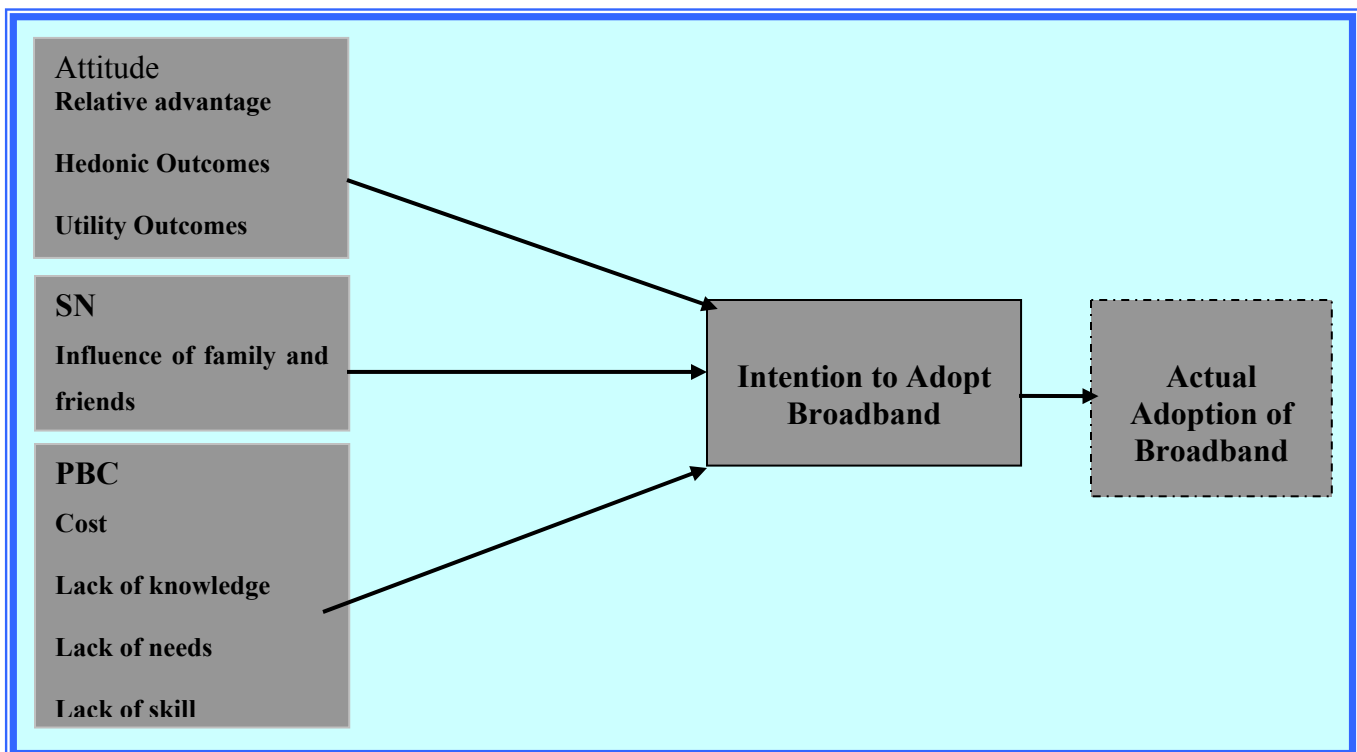
From the analysis of previous studies it was found that the focus of the aforementioned research on the adoption of broadband Internet access has been mainly concentrated on macro-level factors such as government strategy and encouragement, market competition, and experiences from successful nations. Therefore, this research moves further to explore the micro or consumer level factors affecting the adoption of broadband in the UK. Given the slow uptake and decreasing growth of broadband adoption in many countries -including the UK- it was felt that such research would be beneficial since it would identify areas that require emphasis.

## THEORETICAL BACKGROUND

A number of theories and research models have been proposed and tested to understand the individual adoption or acceptance of information technology. These include the Theory of Reasoned Action (TRA) (Fishbein and Ajzen 1975), Theory of Planned Behaviour (TPB) (Ajzen and Madden 1986, 1991), Technology Acceptance Model (TAM) (Davis 1989), the Diffusion of Innovation Theory (Roger 1983, 1995) and Model of Adoption of Technology in Households (MATH) (Venkatesh and Brown 2001). These theories were further modified, extended and integrated by various information systems (IS) researchers. The detailed discussions on each of the theories and models are not possible within the scope of this paper, however to provide an overview, a brief discussion on the most appropriate one is presented hereafter. The MATH model was found to be most appropriate in order to study consumers. Its structural component was adopted from TPB and decomposed TPB, however the detailed factors were particularly designed to study consumers within a household context. Although the MATH model is useful in understanding technology adoption within households, since it was developed to study personal computers (PCs), it cannot be employed to study broadband. This is because broadband and PCs are two different types of technology, therefore items that were selected to predict PC adoption are not necessarily useful to predict broadband adoption. Therefore, the MATH model is modified for this research, and a brief discussion of it is provided below.

## CONCEPTUAL MODEL

For the development of the conceptual model that is utilised in this research, three factors namely attitude, subjective norm and perceived behavioural control (Ajzen 1991) were considered important. Further, the anticipated model of this research is based on the, decomposed theory of planned behaviour (Taylor and Todd 1995), and model of adoption of technology in household (Venkatesh and Brown 2001). The proposed model postulates that a person's intention to adopt broadband at homes is determined by three constructs. These are; (1) **attitude towards behavior**, which describes the perception towards broadband technologies; (2) **subjective norms**, which describes the social influences that may affect the intention to adopt broadband; (3) **perceived behavioral control** that describes the beliefs about having the necessary resources and opportunities to adopt broadband in the home. These three independent variables determine and explain the intention to adopt broadband, which in turn, is expected to predict the actual adoption of broadband. Although figure 1 illustrates the proposed conceptual model, due to limited space an in-depth discussion on the selection of factors cannot be included in this paper. Full details on developing the conceptual model to examine broadband adoption will soon appear in a forthcoming publication.



**Figure 1: Model of Broadband Adoption (Source: Adopted and modified from Venkatesh and Brown 2001)**

## RESEARCH METHOD

A survey research method was considered to be one of the most appropriate approaches to determine the identified factors (Table 1) of broadband adoption. This was decided by using Galliers (1992) guidelines, which suggest that a review on previous research related with particular topic from the perspective of the research approaches would be useful in order to determine a research approach. Therefore, a literature review of articles published during 1992-2003 and within peer reviewed and respected journals such as *MIS Quarterly*, *European Journal of Information Systems (EJIS)*, *Information Systems Journal (ISJ)*, *Information Systems Research (ISR)* and other relevant publications available in the area of technology adoption research was undertaken. Findings from the analysis of the articles that addressed technology adoption issues suggest that mainly two research approaches were employed, namely survey and case study. It was found that a survey was more frequently used research approach than case study. The case study approach was employed to study organizational adoption of technology whilst surveys were used to study a range of objects such as technology users, household and online consumers, senior executives or management and small firms. Considering the results from the literature review of IS journals this study considers surveys as one of the appropriate approach's to investigate consumer level factors affecting

broadband adoption in the UK. The survey was conducted employing a sequential research design (Mingers 2001). This means that questionnaires were employed to determine the identified factors using statistical data, then follow up with a limited number of in-depth interviews to better understand the results.

The respondents of this study were the UK household consumers. In order to avoid any bias in the data from the target population it was decided to use the random sampling technique when selecting the respondents. In order to collect a random data for the target population and within a limited time frame and resources, a self-administered questionnaire is considered to be an appropriate primary survey instrument in this investigation. This is because it addresses the issue of reliability of information by reducing and eliminating differences in the way in which the questions are asked (Cornford and Smithson 1996) and facilitates the collection of data within a short period of time from the majority of respondents (Hall and Hall 1996). This was considered to be a critical issue for this research.

Root	Factor	Expected Impact
Attitude	Relative Advantage	Strong
	Hedonic Outcomes	Strong
	Utility Outcomes	Strong
	Social Outcomes	Weak
Subjective Norms	Primary Influence	Strong
	Secondary Influence	Strong
PBC	Cost	Strong
	Need	Strong
	Skill	Strong
	Knowledge	Strong

**Table1:** Summary of factors expected to drive broadband adoption and non-adoption

### Questionnaire content

The questionnaire used for this research consist of two broad categories of questions: (1) multiple choice questions addressing the social attributes (demographic variables) including age, gender, education, social class and income; and (2) Likert scale questions that will be designed to address the issues related to the factors of broadband adoption (See the factors listed in Table 1). Close-ended multiple-choice questions were included in the questionnaire in order to obtain a high response rate. This is due to instances where respondents preferred to answer close-ended questions within instances of non-interactive, self-administered questionnaires (Fowler 1993). For the purpose of evaluating content and the structure of the survey instrument at initial stages, the questionnaires were sent to a small number of experts within industry and academia. The feedback responses from the experts were used to make improvements to the questionnaire. Following this, a pilot study was conducted for several reasons. (i) To determine the response rate, (ii) to make requests for any constructive comments, (iii) to determine total time required to complete the questionnaire and (iv) to obtain advice on the format and structure from the respondents.

The collected data was analyzed using SPSS version 10.1. The analysis was focused upon calculating importance to the detailed factors associated with the consumers' attitude, subjective norms and perceived behavioural control using the means and standard deviations. This strategy was pursued since IS researchers have recently employed the aforementioned analysis tools to analyze and present research findings using response frequencies, percentage (Webster 1998) means and standard deviations (Venkatesh and Brown 2001). Whilst the aforementioned tools are prevalent in the IS area, the researchers also pursued this route because they were more familiar to them and afforded simplicity and clarity.

### FINDINGS: SURVEY I

The initial snapshot study was conducted to determine the response rate and initial determination of factors. The data was collected from 700 household consumers from the London Borough of Hillingdon. The reason of conducting this study in the London Borough of Hillingdon was that it was easy to access the sample frame (i.e. electoral register) for this region, as it was not possible to do that for the whole of the UK population. The respondents were selected using the stratified random sampling technique from Hillingdon electoral register. The questionnaires were distributed using the postal service to 700 household consumers. A response rate of 25% was obtained. From these results, it was found that broadband adoption within the households is driven by a relative advantage such as faster access; utility outcomes, such as the uses of broadband for work purposes and hedonic outcomes, which is the use of broadband for entertainment purposes. The main factors for the

non-adopters were identified to be the high costs, lack of needs and lack of content and or applications. The findings of the initial survey also suggest that factors such as the subjective norm, social outcome, knowledge and skills are not important for driving and inhibiting broadband adoption. Table 2 summarizes the impact of each items selected to explain the drivers and inhibitors of broadband. Full details of first survey will appear in a forthcoming publication.

Factor	Detailed Factors	Impact
Relative Advantage	Faster access to the Internet	Strong
	Always-on access to the	Strong
	Free home phone line	Strong
	Un-metered access to Internet	Strong
	To download files faster	Strong
Hedonic Outcomes	To play online games	Weak
	For entertainment such as music and movies	Strong
Utility Outcomes	To perform job-related tasks	Strong
	To find educational/research materials	Strong
	To perform home business	Strong
	To help with children's homework	Weak
	To perform the personal & household	Strong
	To communicate with family, friends and relatives	Strong
Social Outcomes	Having broadband enhances my social status	Weak
Primary Influence	Influence from family members and relatives	Weak
	Influence from friends	Weak
	Influence from Kids	Weak
Secondary Influence	Influence from TV/News advert	Weak
Cost	High monthly cost of broadband subscription	Strong
	Cost of purchasing/upgrading the computer	Strong
Need	Lack of need to subscribe the broadband	Strong
Content/Application	Lack of content/applications with broadband	Strong
Knowledge	Lack of knowledge about broadband	Weak
	Lack of knowledge about broadband usage and benefits	Weak
Skill	Lack of skills to use computer and Internet	Weak

**Table 2:** Summary of factors driving broadband adoption and non-adoption

It is important to compare findings of this research to other similar studies focused upon drivers and inhibitors of broadband adoption at consumer level. However this may not be possible, since broadband diffusion is in very early stages in many countries. Such studies are therefore rarely conducted. This argument is supported by two recently published studies (Stanton 2004; Oh et al. 2003). Stanton's (2004) study has stated: "Current studies have examined the use of broadband, but not the reason that an individual chooses to connect to broadband" and called researchers to determine drivers behind the decision to have broadband connection at home. Oh et al. (2003) study was conducted in the South Korea and examined the role of experience in building attitudes. This study as well did not focus upon examining drivers of broadband adoption. This is because most people in South Korea are users of broadband Internet. Therefore, this study (Oh et al. 2003) has called for cross-cultural research to test relationship between attitude and behaviour and also to obtain insights about effects of cultural differences in broadband adoption. Since previous studies that examined drivers and inhibitors of broadband adoption are limited in their scope we will conduct a second survey, to confirm validity of first survey research. The details on the second survey design are provided in next section.

#### FUTURE RESEARCH DIRECTIONS: SURVEY II

The aforementioned survey is conducted within a small part of the UK. Therefore, to generalize the result for whole UK, a second survey will be conducted. This will include a selection of a suitable sample frame for the UK population, creating a random sample and modification of the questionnaire according to results obtained from the first survey. Thereafter, distributing final questionnaire to 1200 residential consumers within the UK using the postal services. Finally, this will then be followed by a data analysis that will be performed using an appropriate statistical package.

## CONCLUSION

The paper concludes that although a number of theories and models are available on technology adoption, they cannot be applied as such to study broadband adoption study at the consumer level. The most appropriate model for this study was found to be the model of technology adoption in households (MATH), however this also needs modification. The paper also concludes that a survey is one of the most appropriate methods that can be use to conduct an empirical investigation on broadband adoption. The findings from the initial survey led us to conclude that although a majority of factors from MATH are appropriate to predict broadband adoption and non-adoption, factors such as social outcomes, subjective norms, knowledge and skills are not significant enough to be included in the final model of broadband adoption. This study looked directly at the impact of factors for the target population. However, it may useful to look at the moderation affects of demographic variables such as gender, education, income, and occupation. Due to a lack of time this was not possible to include in this paper, however we will consider examining such impacts in our final study. The limitation of initial survey was that the sample was drawn from small region therefore the findings cannot be generalized for the whole UK population. This limitation will be overcome by conducting a second survey, where the sample will be drawn from whole UK population. However, the limitation to conduct the final study is that in order to obtain a random sample it is difficult to obtain access to the residential consumers addresses for the whole of the UK.

The contributions of this research are considered to be immense and therefore, this research is viewed to be pertinent for the current period. The gradual adoption of broadband by the household consumers is not only an industry concern, but a government aim as well. Therefore this research study will be a substantial contribution to all the relevant stakeholders including, the policy makers and the providers of the innovation, in this case the telecommunications industry. Policy makers around the globe are currently determining ways of increasing the penetration rates of subscribers within their own countries. Therefore, information that is based upon the experiences of leading countries' will be useful. The telecommunications industry is interested in determining ways of improving their current strategies leading to the adoption of broadband. Such questions have led to the role of academics becoming pertinent as they can offer an unbiased and less distorted view of the diffusion strategies pursued by various other successful countries.

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