

Internet adoption as a two-stage transition

Converting internet non-users to internet users and to online buyers

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Identifying the Internet Non-User (INU), Internet User (IU) and Online Buyer (OB) is important for marketers to enable appropriate target marketing, distribution, advertising and customer service. Such identification is also critical to public policy makers desirous of reducing the digital divide. Despite the criticality of identifying the INU, IU and OB, research in marketing on the internet has not focused on the associated problem of identifying the determinants of the three categories. This research offers a conceptual model, based on innovation diffusion theory, for identifying the individuals in each of the three categories on the basis of innovativeness, internet use and online trust. Demographic variables and availability of home computer are other factors used to theoretically predict membership of INU, IU and OB. Implications for practice, public policy and research are drawn.

Introduction

There is substantial research on the determinants of adoptive behaviour in the marketing literature. These include theoretical papers that explain the reasons why consumers may or may not try new products. These works give us an indication of the categories of typical determinants of adoptive behaviour. Empirical researchers have also drawn from these theoretical findings to investigate adoptive behaviour in specific categories of new products. For example, Dickerson and Gentry (1983) have examined how

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consumers accepted the usage of home computers. Similarly, Jain *et al.* (1999) have looked at the antecedents of adoption of 'telephones'.

Consider the following, however, in the context of internet adoption:

- Remember the free AOL disks found everywhere that first offered 20 hours free, then 100 hours free, 250 hours free, 500 hours free and, recently, 1000 hours free internet access? Every time one bought a new computer, free AOL was available as a package deal. Well, the equation has reversed. Now AOL is offering a free computer if you sign up for its internet service. It appears that *free* internet was not as powerful as a *free* computer to get people online.
- Even if you are not selling you want people to know your website. Coca-Cola wants you to know about www.coke.com. CNN, NBC and CBS keep emphasising their websites. For example, you watch a cooking show on TV and for the recipe you are advised to go to the channel's website. Firms do not necessarily want you to 'buy' anything online, but every packaged consumer good from toothpaste to toilet cleaner has the website mentioned on the label. All service providers, from the utilities company to TIAA-CREF, urge you to check your account information online. When you call your insurance company on a 1-800 number (in the US) it wants you to go to its website for most questions. Quite frankly, most companies with websites want you to shift there for better and cheaper communication, and an overall better relationship. Basically they want you to become at least internet users.
- Placing an order online, paying utility bills online or restructuring your 401 K online you need to have a high level of comfort with the internet. You need to have trust that on the internet your credit card and account details will not become the victims of identity theft. Hoping to increase consumer comfort, many credit cards offer zero liability for online fraud. Cable-based internet may be much faster than DSL but DSL marketers emphasise the greater security of DSL internet. Clearly, once you are online it takes something extra for you to become a regular online buyer who buys online and transacts sensitive account information online.

Clearly, industry recognises the internet adoption problem. Everett Rogers, the noted diffusion of innovation scholar, says: 'The most recent event to influence the development of the field [diffusion of innovations] is the Internet' (McGrath & Zell 2001, p. 389). Despite the importance of

internet diffusion from Internet Non-User (INU) to Internet User (IU), and Internet User (IU) to Online Buyer (OB), there is little academic research that addresses the characteristics of the three types of individuals in a given market. We conceptualise the three categories, hereafter abbreviated as INU (Internet Non-User), IU (Internet User) and OB (Online Buyer), as discrete and non-overlapping with the adjacent category. Thus INU and IU do not overlap, and if an IU member has bought something online we classify that individual as OB.

Marketing managers who understand the three categories of INU, IU and OB in their markets, can attract new customers and service existing customers more effectively. Auto marketers – for example, www.honda.com or www.ford.com – treat an internet customer differently, and route an internet customer straight to an internet marketing manager. Such a routing makes sense because an IU customer is much more informed and ready to buy than an INU who walks into a regular car dealership prompted by traditional media. Thus, upon learning if and how his or her customers use the internet, the marketing manager can appropriately use the internet to deliver the 4Ps to the IU and OB segments; similarly, marketing messages can be delivered through traditional media more effectively to the INU category. By doing all this, efficiency and effectiveness in customer relationship management in all three categories can be attained.

Our paper draws from existing literature on the adoption of innovation to identify possible drivers of consumer behaviour. We show the reasons why some of these variables are likely to affect adoptive behaviour and summarise our arguments in the form of specific hypotheses. We suggest that some of these independent variables should be common to both the transitions (i.e. from INU to IU and IU to OB). In addition, we suggest that there are variables that are likely to be more relevant for one but not both kinds of transition. We use individual-level data to empirically test these hypotheses. Our findings confirm some of our hypotheses but also disconfirm several others. What emerges is an intriguing view that the factors that drive these two kinds of transition are in some ways quite different. We relate these findings to implications for public policy and marketing managers.

The rest of the paper is organised as follows. The next section describes the problem and introduces our conceptual model. After that, the hypotheses and model variables are presented. The next section presents the methodology and analysis. The one after that discusses the implications of our empirical results and the final section discusses implications for practice and research.

Problem conceptualisation

Despite the importance given to the internet by marketing scholars (Hoffman & Novak, 1996; Ratchford *et al.* 2003) and calls for research on the implications of the internet on consumer buying behaviour (Alba *et al.* 1997; Deighton 1997), research on internet adoption has remained fragmented. While marketing scholars have been concerned with the specifics of internet marketing – for example, internet recommendation systems (Ansari & Mela 2003) and electronic agents (Cooke *et al.* 2002) – research on internet adoption has been left to scholars of overseas markets such as France (Fornerino 2003) or Tanzania (Mutula & Ahmadi 2002) or to scholars in the information system (IS) and computer science faculties (e.g. Montealegre 1999; Teo & Pian 2003). International scholars have taken country-specific views and have stopped short of examining internet buying in their markets. IS scholars have examined internet diffusion only in terms of servers, stopping short of understanding online buying. While valuable for marketers of internet infrastructure products and public policy makers, these IS studies are not very helpful to the traditional marketing manager who wants to appropriately target her/his existing customers using the internet. Thus, three distinct streams of research into internet diffusion, with three different target audiences, have emerged in the literature. The IS and computer science scholars address the INU to IU transition, for example by using number of servers as an estimator with the internet infrastructure marketer in mind. Marketing scholars have also found the INU to IU transition interesting but the target audience seems to be the public policy makers of developing countries. Internet marketing scholars seem to have a target audience of pure-play internet marketing managers. Internet marketing scholars therefore seem to deal more with the buying behaviour of the OB than the transition from IU to OB.

Given the collapse of the pure dotcoms since 2000/01 and the integration of the internet into mainstream marketing, a large vacuum has developed in the literature. This vacuum refers to the perspective of a traditional marketing manager who wants to take full advantage of internet use among the firm's target markets.

Our formulation of the internet diffusion problem takes the marketing manager's perspective in the new economy (Sheth & Sisodia 1999; Kotler 2003). We maintain that in the new economy, marketing managers must be able to re-examine their marketing mix and customer relationship strategies on the basis of whether the target customer goes online and if the customer might actually buy online. We take a cue from Hoffman and

Novak (1996), who say that 'new bases of market segmentation are needed' (p. 66). In practice, businesses seem to be at least somewhat aware of the three segments of INU, IU and OB in their markets, as suggested by Geyskens *et al.* (2002):

... many firms have not yet established an internet presence and many others use their Web sites only for promotional purposes and not yet as distribution channels online ... In the United States, recent estimates indicate that more than 40% of all businesses do not yet sell online (www.nua.com/surveys; www.ecommercecommission.org), a number that increases to more than 70% when the largest businesses are excluded.

(Geyskens *et al.* 2002, p. 166)

Given that businesses seem to be working on their website development with at least some expectations of behaviour from their customers, we now turn to the innovation adoption process of consumers. According to Rogers (1995), a person's innovativeness is 'the degree to which an individual is relatively earlier in adopting new ideas than the other members of his social system'. This definition forms the basis of substantial modelling and theorising in innovation diffusion in marketing (e.g. Gatignon & Robertson 1989; Mahajan *et al.* 1995; Sultan *et al.* 1996) and information systems (IS) (e.g. Davis *et al.* 1989; Gefen *et al.* 2003). Four key assumptions are implicit in the innovation diffusion literature:

1. The innovation itself is a new product (e.g. computer, PDA) and buying it constitutes adoption.
2. The context of all innovations is diffusion within a 'social system'.
3. The bell-shaped adoption curve suggests some delay in adoption and 'laggards' would be the last to adopt.
4. Not all consumers in a social system would adopt the innovation.

We adapt these assumptions to the internet diffusion problem and suggest that:

- Internet diffusion is actually the diffusion of two different 'products' – first, the adoption of the internet by the INU and, second, the adoption of online buying by the IU; these two transitions may be thought of as two different bell-shaped curves.
- Accordingly, we see the social system in two parts: one made up of INU and IU, and the other made up of IU and OB.

- In each social system, we view the adopters and non-adopters cross-sectionally and simultaneously; thus between INU and IU, at a point in time, we view the former as 'laggards' and the latter as 'innovators'; similarly, we view the OB as an innovator and the IU as the laggard in the second social system of IU/OB.
- Within each of our two social systems we do not expect that at any foreseeable time there will be full adoption; thus we do not expect *all* Internet Non-Users to become Internet Users in the first stage, and not *all* Internet Users to become Online Buyers, in the second stage.

Our theorising of the internet adoption phenomenon combines the three categories of Internet Non-User (INU), Internet User (IU) and Online Buyer (OB). By reformulating the internet diffusion problem from the existing dichotomous perspectives of INU/IU (of the IS scholars and international internet marketing scholars) and the IU/OB (of the US internet marketing scholars) we take a 'trichotomous' view of INU, IU and OB, which is simultaneous and holistic. We aim to contribute to the understanding of marketing managers to help serve these three segments in their existing markets more effectively. We see the two social systems containing the three categories (INU, IU and OB) possessing different kinds of innovativeness. We suggest that, between INU and IU, innate innovativeness and offline purchase and consumption innovativeness will be important apart from demographics. For the second social system of IU and OB we suggest that internet use and online trust may be additional important differentiators, as all members of this social system are internet users. We discuss more details hereafter.

In Figure 1 we present a conceptual model of segmentation of INU, IU and OB. We posit that five broad factors are theoretically important to the adoption of internet (from INU to IU) and the transition of some Internet Users to Online Buyers (IU to OB). We will discuss each of these factors as testable hypotheses in the context of the two types of transition.

Model and hypotheses

Innate innovativeness

Innovativeness here refers to consumers' inherent or innate tendencies to seek out new ideas, products or services (Midgley & Dowling 1978). In defining innate innovativeness we follow Midgley and Dowling (1978, p. 235) and exclude the impact of communication that early adopters may

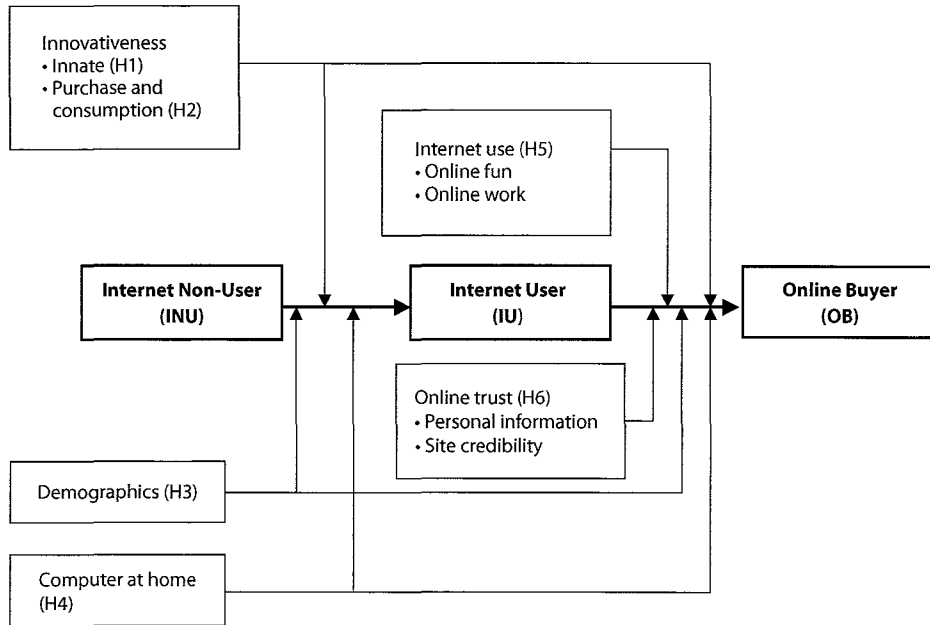


Figure 1 A conceptual model of segmentation of INU, IU and OB

have on late adopters. The innately innovative consumer is the first in his/her social system to try a new product, with other factors (such as communication effects) remaining constant. Past research in other contexts has indeed supported the notion that innately innovative consumers would be the first to try new products, services or ideas (Joseph & Vyas 1984). We suggest that this factor will be an important determinant in the adoption of the internet (INU to IU) and also for Internet Users to become Online Buyers (IU to OB).

Innate innovativeness is intuitively a compelling construct that should facilitate the transitions in our two-stage model. Quite simply, individuals that are more innately innovative in the INU-IU social system should be seen in the IU category. Similarly, the more innately innovative IU should be seen more prominently among the OB category. Early research in internet adoption (e.g. Reisenwitz & Cutler 1998; Sultan 2002) has explored other perspectives of these issues in the first transition from INU to IU.

In the context of the INU to IU transition, Reisenwitz and Cutler (1998) examined the role of dogmatism. Dogmatism may be viewed as a construct

somewhat opposite to innovativeness: a dogmatic person is one who is stuck on dogma or old fixed ways, and is not willing to change or try new things. Reisenwitz and Cutler (1998) found that the IU was not less dogmatic than INU, as intuition might suggest. Between the IU to OB transition, Citrin *et al.* (2000) investigated the direct and moderating role of open-processing innovativeness. Open-processing innovativeness involves individuals with high inherent or innate innovativeness (Joseph & Vyas 1984). Citrin *et al.* found that open-processing innovativeness did not have an impact on internet buying among Internet Users. Thus open-processing innovativeness did not affect the transformation of an IU to OB. In contrast, studying the IU and OB group, Sultan (2002) found that innate innovativeness did appear to be high among internet users initially, although over time the innate innovativeness score declined in the consumer panel studied.

Given the conflicting nature of results and the compelling nature of the construct we offer the following testable hypotheses.

H1a: IU will be more innately innovative than INU.

H1b: OB will be more innately innovative than IU.

Offline innovativeness in purchase and consumption

Consumption and purchase innovativeness refers to the offline buying behaviour innovativeness of individuals (Baumgartner & Steenkamp 1996; Steenkamp *et al.* 1999). Such individuals are explorative when it comes to purchasing and also tend to seek out more information before buying. This factor is more specific with respect to buying. Given the enormous search and comparison possibilities on the internet, we argue that those individuals who are explorative and information seeking will take up the internet for information search and online buying.

The consumer engages in exploration and information seeking during offline buying. For example, a thrifty housewife who keeps track of discount coupons and looks out for a good deal should be more likely to adopt the internet and search for coupons than someone who is not orientated towards offline opportunities of searching and comparing various options in the market. We argue that those who exhibit exploratory buying behaviour offline are likely to be motivated to become Internet Users. Internet Users who show innovativeness in offline purchase and consumption should be among the first to buy online.

Stated formally:

H2a: IU will have higher offline innovativeness in purchase and consumption than INU.

H2b: OB will have higher offline innovativeness in purchase and consumption than IU.

Demographic characteristics

Innovative consumers, in general, have been identified as younger, higher in income and education, and generally as more upmarket (e.g. Schiffman & Kanuk 2000). According to several studies (e.g. Kraut *et al.* 1996), younger people would be more likely to adopt the internet. Younger people are more flexible, more eager to learn, and less afraid of failure and ridicule when it comes to adopting a new technology like the internet. Similarly, higher education develops higher cognitive abilities and can lead to task settings at school and work in which computer use plays an integral part.

Higher income also appears correlated with both internet use and online buying, primarily because higher income suggests workplace access to computers (Kraut *et al.* 1996). After a person becomes an Internet User, higher incomes suggest that the individual will be more willing to take the initial perceived risk of placing online orders.

Diffusion of innovation perspectives suggest that younger, wealthier and more educated consumers would be more likely to take up innovative products and services (Anderson *et al.* 1995). In the computer and internet context, several studies have included demographic characteristics, with mixed results.

Kraut *et al.* (1996) studied the adoption of the internet by 50 families with teenagers. Commenced in March 1995, the families were lent or sold computers and provided internet connections along with a 14.4 Kbps modem. The families were chosen from four different socio-economic backgrounds in Pittsburgh. Internet adoption appeared similar in all four groups once the equipment was provided and family members were trained. Teenagers in all categories of families were ahead of their parents in internet adoption.

Vrechopoulos *et al.* (2001) suggest that higher income and professional education characterise OB. Similarly, Donthu and Garcia (1999) found that the online buyer tended to be older and have a higher income. Recent

studies such as Sultan's (2002) suggest that Online Buyers are 'mature and relatively affluent'. Our perspective of simultaneously studying the two transitions of INU to IU and IU to OB in a common market draws upon the growing body of findings in separate studies of both transitions. We argue that while younger, educated people in a market will be ahead in becoming IU from INU, it is the older and affluent consumer who will be an online buyer in the same market. Stated formally:

H3a: IU will have higher income, education and lower age compared to INU.

H3b: OB will have higher income, education and higher age compared to IU.

Availability of home computer

Availability of an innovation to the prospective adopter is a major determinant of the actual adoption. Research in the information system (IS) tradition (Davis 1989; Davis *et al.* 1989; Gefen 2003) has considered the Technology Adoption Model (TAM) as important in explaining adoption of information technology by the consumer. Briefly, the TAM model states that technology adoption is a function of the 'perceived usefulness of adoption' and the 'perceived ease of adoption' by the prospective adopter. The 'perceived use' determinant of TAM involves an awareness of the adopters about how useful the technology will be to their careers and lives. The 'perceived ease' of TAM is the extent to which the prospective adopter views the technology to be easy to learn. Thus the TAM posits that technology that is seen to be useful to the adopter, and that is perceived to be easy, is most likely to be adopted.

In our formulation of the internet adoption problem, we follow IS scholars (Venkatesh & Davis 1996; Gefen 2003), and consider both the transitions to be types of technology adoption within the TAM framework. We maintain that the transition of an INU to IU is a kind of technology adoption. Similarly, the transition of IU to OB is a different form of technology adoption.

We argue that, if the computer is available at home, then the ease of using the computer will be high and INU will be more likely to become IU. Similarly, if an IU has a computer at home, the ease of use will be higher and online buying will be more likely.

We state formally:

H4a: IU is more likely to have a computer at home than INU.

H4b: OB is more likely to have a computer at home than IU.

Internet use

Internet use refers to the actual quantity and variety of internet usage by the IU and is applicable only to the IU to OB transition. Earlier innovation research (Hirschman 1981; Ram & Jung 1989) has established the importance of the product use construct in technology adoption. This stream of research provided important guidelines for manufacturers of durables to launch different models of products for different segments of use innovators. Thus consumers identified as not likely to use complicated programming features in washing machines may be provided simpler washing machines with fewer programmable options. On the other hand, consumers who are more likely to use advanced programming features might find value in advanced programming features in washing machines. To differentiate between IU and OB, we take up the construct of internet use. We examine whether variety and quantity of internet use differentiates IU and OB in the social system containing Internet Users and Online Buyers.

Citrin *et al.* (2000) discuss the issue in the context of the internet and conclude that higher internet use is related to higher propensity to buy online. In a similar vein, Gefen (2003) notes that it is not only the perceived usefulness of the internet and the perceived ease of use that drives online buying, but also it is a matter of how 'habituated' a consumer becomes to the internet that promotes online buying. The habit of using the internet should in our view promote online buying. In other words, those Internet Users (IU) who use the internet more are likely to become Online Buyers. We state formally:

H5: OB will have higher previous internet use compared to IU.

Online trust

Online trust refers, for example, to the confidence an internet user feels in parting with personal financial information, such as credit card numbers, online. Consumers worry about what will happen to their personal information after it is submitted (Hoffman *et al.* 1999). Consumers feel

that their credit card details could be stolen on the internet and misused in various ways including being charged for purchases one did not make, identity theft and the creation of fraudulent credit accounts. This variable, we believe, is important in converting IU to OB in our diffusion problem.

It is well recognised in the literature (Gefen 2000; Urban *et al.* 2000; Gefen *et al.* 2003) that one of the impediments to the growth of online buying is the potential lack of trust that individuals have with regard to the internet as a medium for buying products. Once an individual starts using the internet and is otherwise qualified (has a credit card, finds appropriate quality/price products on the internet) the last impediment to buying online is online trust.

Recent literature (Urban *et al.* 2000; Gefen *et al.* 2003) examines how customers choose between seller websites, and evaluates the role of trust in choosing one website over another. We step back, and argue that higher online trust will characterise an Online Buyer compared to an Internet User.

Stated formally:

H6: OB will have online trust that is higher than IU.

Methodology

Questionnaire and measures

The goal of this research is to identify variables that help differentiate Internet Non-Users (INU), Internet Users (IU) and Online Buyers (OB). Each hypothesised independent variable (constructs corresponding to H1 to H6) was operationalised based on existing scales in the literature, pre-tests and an extensive pilot study.

Our formulation of the internet diffusion problem conceptualises every member of the population to be a member of one of three categories (i.e. INU, IU and OB) of two social systems – INU, IU and IU, OB). To examine the two transitions in our internet diffusion problem, we devised a three-part questionnaire. The first part of the questionnaire was administered to all respondents from the three categories INU, IU and OB. The second part was administered to both the IU and OB and asked internet-related questions. All respondents answered part three, which had offline behavioural questions and questions related to demographics. The first part introduced the topic of investigation and ascertained if the respondent was an Internet User. If the respondent was an Internet User, the second

part of the questionnaire was administered. Questions in the second part included those relating to internet use (H5), and those relating to online trust (H6). The third part of the questionnaire, administered to all respondents, had items relating to innate innovativeness (H1), innovativeness in purchase and consumption (H2), demographic data (H3) and availability of home computer (H4).

The data were factor analysed for each construct, and factor scores were used in the subsequent logistic regression analysis. Measures used are summarised in Appendix 1. Innate innovativeness (based on Leavitt & Walton 1975, 1988) has two dimensions: that of an innovative explorer or one who is explorative; and that of a person who is risk averse (conservative) and tries to stick to tried and tested ways of doing things. Similarly, innovativeness in purchase and consumption has two dimensions: exploratory acquisition of products (EAP); and exploratory information seeking (EIS) behaviour (Baumgartner & Steenkamp 1996). The demographic variable is made up of age, income and education. In addition, the answer to the question of computer at home is coded in as a dummy variable. The online variables applicable to the IU and OB categories were internet use and online trust. Internet use upon factor analysis yielded two constructs of 'online fun' and 'online work.' Online trust loaded as 'divulging personal information' and 'site credibility'.

Data collection and sampling

The data collection and sampling involved an upper level marketing research class at an affluent well-endowed US university. *US News and World Report 2005* ranks this university in the top 100 'Best National Universities' in the country. Students report an average SAT score of 1160 and the university reports a good freshman retention rate of 82%.

As a part of the marketing research course (following Roy *et al.* 2001) the 41-student class was divided into nine teams and asked to each collect 10–12 responses per student from the three categories of INU, IU and OB. A convenient sampling method was followed in that a student was encouraged to interview relatives, neighbours and friends who would belong to one of the three categories of INU, IU and OB. Since it was known that 50% of the US population was INU the students were encouraged to interview five to six INU respondents and not be concerned about the exact IU/OB numbers for the rest of the respondents in their quota. The entire questionnaire was made available online for INU/OB respondents, and students entered the data for INU. The data-collection

exercise carried academic credit and was closely monitored by the professor.

Total usable surveys collected were 187 Internet Non-Users (INU), 95 Internet Users (IU) and 98 Online Buyers (OB). The demographics of our sample indicated that 82% of the Internet Users and Buyers were below the age of 45 and 87% had high school or further education, and 81% had a family income of over \$30,000 per annum. These compare favourably with the recent figures from the Pew Internet and American Life Project, where 81% are below age 45, 85% have high school or further education, and 83% have more than \$30,000 family income. In addition our convenience sampling has been followed in several internet studies, including Ko *et al.* (2005) and Novak *et al.* (2000).

Two datasets were created; the first combined INU and IU, and the second had IU and OB.

Analysis and results

The analysis was conducted in two phases for each of the two datasets Internet Non-User/Internet User (INU/IU), and Internet User and Online Buyer (IU/OB). The first phase involved logistic regression of the dependent variable Internet Non-User (INU) and Internet User (IU) with the hypothesised independent variables of innate innovativeness, offline purchase innovativeness and the demographics. The next logistic regression was for the dependent variable Internet User (IU) and Online Buyer (OB) and all the independent variables as in the INU/IU category plus the internet use and online trust variables.

The second phase of analysis involved drawing an estimation sample of 85 random cases each from the three categories INU, IU and OB. From the remainder data in each category a holdout sample of ten each was drawn. Two estimation datasets of 85 cases of INU and IU and IU/OB were created. The logistic regression models were re-estimated in the estimation samples and the classificatory power was tested on the holdout samples of ten cases of INU/IU and IU/OB.

Internet Non-User (INU) and Internet User (IU)

The results of logistic regression of independent variables innate innovativeness, offline purchase innovativeness and the age-income-education demographic are presented in Table 1.

The odds ratio in logistic regression estimates the odds of membership by change of the predictor variable and is computed as $\text{Exp}(B)$. In our

Table 1 Internet Non-User (INU) and Internet User (IU) logistic regression model using full dataset

Related hypotheses	Independent variable	B	Sig	Exp (B)
	Constant	-3.192	0.000	0.041
H1a	Innovativeness: openness of information processing			} Not significant
	• innovative conservative	0.122	0.727	
	• risk averse	0.094	0.759	
H2a	Exploratory acquisition of products (EAP)	0.722	0.395	
	Exploratory information seeking (EIS)	3.406	0.065	
H3a	Demographics: age, income, education	0.117	0.732	
H4a	Computer at home	3.829	0.000	46.021

INU/IU dataset we found that having a computer at home was a significant predictor of whether the individual was a member of the IU group or not. The odds ratio of 46.02 (Exp (B)) suggests that in the INU/IU social system a computer at home makes an individual more than 46 times as likely to be an IU than when the individual does not have a computer at home.

In the next phase of the testing (see Table 2) of the logistic regression model we created an estimation dataset by taking a random sample of 85 cases from the Internet Non-User category and 85 cases from the Internet User category. Once again in this estimation dataset the only significant variable was a computer at home with a β value of 3.477 (instead of the full sample β value of 3.829). We now took the holdout sample of ten cases each from the remaining cases of INU and IU, and used the logistic regression function to calculate the predicted probability of the group membership for group INU and IU. We found that eight out of ten cases were correctly classified for the INU category and ten out of ten were categorised correctly for the IU category by the estimation model where the $\beta_0 = -2.269$ and the $\beta_1 = 3.477$.

Table 2 Internet Non-User (INU) and Internet User (IU) estimation and holdout samples ($n = 85$ each in estimation and $n = 10$ each in holdout sample)

Independent variable	B	Sig	Exp (B)
Constant	-2.269	0.000	0.103
Computer at home	3.477	0.000	32.362

Classification results: 80% INU and 100% IU categorised correctly

We used the proportional chance criterion to evaluate whether our predictive model performs better than by chance alone. We use $C_{\text{PRO}} = p^2 + (1 - p)^2$ (Hair *et al.* 1998) where C_{PRO} is the proportional chance criterion, p is the proportion of INU and $1 - p$ is the proportion of IU. C_{PRO} for the INU/IU sample is 0.44 or 44%. The average percentage of correctly classified cases in our holdout sample is 90% with 100% correct prediction for IU and 80% for INU. Our prediction rate is substantially higher than C_{PRO} based on the computer at home variable.

The computer at home variable as a predictor is intriguing so we investigated our database further. We ran a logistic regression with computer at home as the dependent variable and the other variables as predictors. We found that the demographic variable and the 'innovative explorer variable' were significant predictors of computer at home. We then regressed age, income and education against computer at home to understand the components of demographics that seem to have the highest impact on having a computer at home. The significance of age was at 0.011, income was at 0.076 and education was at 0.000. Thus higher education was more linked to having a computer at home. We next ran a logistic regression between computer at home and the four items comprising 'innovative explorer' from Appendix 1. Except for item c, about whether the respondent tried brands earlier than her/his friends, all other items appeared significantly related to the computer at home variable.

We will discuss the implications of this finding in the 'Discussion' and 'Implications for research and practice' sections, below.

Internet User (IU) and Online Buyer (OB)

The IU to OB transition was examined in a similar fashion as the INU/IU transition above. The results of logistic regression of independent variables – innate innovativeness, offline purchase innovativeness, and demographic, internet use and online trust – are presented in Table 3.

Two variables that came up as significant were the two dimensions of trust measured as 'personal information' and 'site credibility'. Personal information had a $\beta = 0.898$ with significance of 0.000 and Odds Ratio/Exp (B) = 2.456. Site credibility had a $\beta = 0.479$ with significance of 0.006 and Odds Ratio/Exp (B) = 1.614.

In the next phase of the testing (see Table 4) of the logistic regression model we created an estimation dataset by taking a random sample of 85 cases from the Internet User (IU) category and 85 cases from the Online Buyer category. Once again personal information and site credibility both

Table 3 Internet User (IU) and Online Buyer (OB) logistic regression model

Related hypotheses	Independent variable	B	Sig	Exp (B)
	Constant	0.064	0.706	
H1b	Innovativeness: openness of information processing different from annex i			} Not significant
	• innovative conservative	1.070	0.301	
	• risk averse	0.666	0.414	
H2b	Exploratory acquisition of products (EAP)	0.427	0.514	
	Exploratory information seeking (EIS)	0.211	0.646	
H3b	Demographics			
	• age, income, education	0.146	0.702	
H4b	Computer at home	0.981	0.322	
H5	Higher internet use			
	• online fun	0.159	0.690	
	• online work	0.622	0.430	
H6	Online trust			
	• personal information	0.898	0.000	2.456
	• site credibility	0.479	0.006	1.614

showed up as significant. Personal information had a $\beta = 0.928$ and site credibility had a $\beta = 0.482$. We used the logistic regression function to predict the ten cases remaining in the IU data and a random ten cases out of those remaining in the OB data. We found that six out of ten cases were correctly classified for the user (IU) category and seven out of ten were categorised correctly for the OB category by the estimation model where the $\beta_1 = 0.928$ and the $\beta_2 = 0.482$. The average correct classification in the holdout sample of IU and OB was thus at 65%, which is better than the chance criteria of C_{PRO} of 50% based on the IU/OB sample.

To investigate which elements of the Trust construct (see Appendix 1) were important for the IU/INU classification we ran a logistic regression

Table 4 Internet User (IU) and Online Buyer (OB) estimation and holdout samples ($n = 85$ each in estimation and $n = 10$ each in holdout sample)

Independent variable	B	Sig	Exp (B)
Online trust – personal information	0.928	0.000	2.533
Online trust – site credibility	0.482	0.100	1.620

Classification results: 60% IU and 70% OB categorised correctly

with the ten elements of our trust construct. We found that only one of the eight scale items for the trust construct appeared significant. This was the item that said people were most afraid of being double charged on their credit card. We will consider these findings in the 'Discussion' and 'Implications for research and practice' sections, below.

Discussion

We had expected that the internet was one more innovation (albeit a two-stage one) that would first attract adopters (INU to IU), and would then convert the adopters to online buyers (INU to OB). We hypothesised (Figure 1) that the predictor variables for this would be a combination of variables known to typically moderate innovation in general, coupled with some online specific behaviour variables. We will now consider each of our hypotheses in turn (see Table 5).

Our first hypotheses (H1a and H1b) were about the innate innovativeness of consumers, as they became Internet Users and Online

Table 5 Summary of hypotheses and results

No.	Hypotheses	INU/IU prediction	INU/IU found	IU/OB prediction	IU/OB found
H1a	INU will be more innately innovative than IU	+	ns		
H1b	OB will be more innately innovative than IU			+	ns
H2a	IU will have higher offline innovativeness in purchase and consumption than INU	+	ns		
H2b	OB will have higher offline innovativeness in purchase and consumption than IU			+	ns
H3a	IU will have higher income, education and lower age compared to INU	+	ns		
H3b	OB will have higher income, education and higher age compared to IU			+	ns
H4a	IU is more likely to have a computer at home than INU	+	+		
H4b	OB is more likely to have a computer at home than IU			+	ns
H5	OB will have higher previous internet use compared to IU			+	ns
H6	OB will have online trust that is higher than IU			+	+

Note: ns = not significant

Buyers. We had hypothesised that innate innovativeness would be a differentiator between the INU and IU, and also a differentiator between an IU and an OB. Our analysis (Tables 1 and 3) suggests that, at both the stages (INU to IU and IU to OB), innate innovativeness is not a significant predictor variable. Interestingly, however, innovativeness does come up as a predictor of computer at home.

We had expected offline innovativeness in purchase and consumption (H2a and 2b) to be differentiating variables between the two sets of categories INU to IU (Table 1) and IU/OB (Table 2). We had operationalised offline purchase and consumption in terms of two measures, exploratory information seeking (EIS) and explorative acquisition of products (EAP). We found the EIS effect to be reflected in a β of 3.406 and a significance of 0.065 (see Table 1). The relationship is, however, marginally significant, and not strong enough to allow us to identify EIS as a differentiator variable between INU and IU. Neither EIS nor EAP significantly affected INU/IU or IU/OB.

Hypotheses 3a and 3b concerned demographic differentiators between INU, IU and OB categories of internet users. The age–income–education variable did not appear significant in our logistic model for either INU and IU, or IU and OB.

Hypotheses 4a and 4b argued that having a computer at home would increase the chances of INU moving to IU, and IU moving to OB. Our data suggest strong support for the computer variable in the INU to IU transition. We had a strong odds ratio of 46.02 (Table 1), indicating that a person with a computer at home was over 46 times as likely to access the internet than someone who did not have a computer at home. However, having a computer at home did not appear significant (H4b) in the conversion of an IU to OB. Thus computer ownership had a very different effect on the INU/IU transition compared to that on the IU/OB transition.

Hypotheses 5 and 6 were designed with variables relevant for the Internet User who might convert to becoming an Online Buyer. We said in Hypothesis 5 that online activities might persuade an Internet User to become an Online Buyer. We had classified online activities as ‘work’ related or ‘fun’ related. Our data did not support our hypothesis that online activities helped convert Internet Users to Online Buyers.

Our Hypotheses 6 had stated that higher online trust would characterise an Online Buyer (OB). We had measured trust in two dimensions, as disclosing personal information and site credibility. We found that both these dimensions were significant in our logistic model differentiating category IU from OB. Using these variables we could predict 60% of IU

and 70% of OB category in the holdout samples (Table 4). To investigate each element of the ten items in the trust construct (see Appendix 1) we ran a logistic regression of the trust items with IU/OB status. We found that only one of the eight scale items for the trust construct appeared significant. This was the item which stated that people were most afraid of being double charged on their credit card. We will examine the implications of this finding in the next section.

Implications for research and practice

We believe our research makes a conceptual contribution by reformulating the internet diffusion problem by viewing it as two social systems. We integrate a wide variety of literatures to argue that the internet diffusion problem for the purposes of marketers needs to be viewed specifically as a *two-stage transition*. These two transitions are, first, from INU to IU and, second, from IU to OB. After reformulating the internet diffusion problem we examined the literature for identifying potential pointers to important factors that might predict membership in each category. We developed four hypotheses to explain the first conversion from INU to IU, and six hypotheses to explain the second transition from INU to OB. We presented the hypotheses and model in Figure 1. Since the primary purpose of our research was to understand the drivers of the INU/IU and IU/OB transitions, we chose to conduct logistic regression with two datasets. In our data an individual could be a member of only one of the three groups (i.e. INU, IU or OB). For example, if an individual had bought something online, that individual would be a member of the OB group despite being an internet user.

We then analysed our data in two stages. We first estimated a full data model (Tables 1 and 3) and then tried an estimation model with an estimation dataset for each social system (Tables 2 and 4). We found that only one variable came up significant in the first transition of INU to IU. This variable was 'availability of computer at home'; intriguingly, this variable was not important in the second IU/OB transition. We tested our holdout sample and found that we could predict 80% of INU accurately and 100% of IU accurately based on this one variable.

For the second transition from IU to OB we found online trust to be the only significant predictor. We could predict 60% INU and 70% OB in our holdout sample based on this variable. All these predictions were superior to standard benchmark prediction rates.

Clearly an 'extrinsic to the consumer variable' (i.e. availability of computer at home) seems to be driving the INU/IU transition. AOL seems to be doing right by providing a free computer to promote its internet service, as pointed out at the start of this paper. The INU/OB transition seems more of an 'intrinsic to the consumer issue', being driven by online trust. Industry seems active with various mechanisms, that we describe later, to foster consumer trust online.

Our research has important implications for the practices of at least three constituents: marketing managers of firms that traditionally operate in an offline environment, public policy makers, and pure play internet businesses. Marketing managers responsible for business-to-consumer (B2C) marketing are interested in utilising the internet for marketing to their target market. Public policy makers are interested in reducing the digital divide between Internet Non-Users and Internet Users. In addition, public policy makers would like the population to adopt the internet for various public dealings, from the e-filing of tax returns to electronic voting. Pure play internet businesses are interested in converting Internet Users to Online Buyers to make internet business more viable. We will consider the implications of our research for these three constituents, in turn.

Many major B2C businesses have some kind of web presence today. Marketing managers seem to be increasingly realising the value of communicating with their clients via the web. The findings of our study suggest that they can parsimoniously identify INU in their clientele by simply finding out if they have a computer at home. Such a question is non-threatening and can be asked at checkout time by every major retailer. This one piece of data can greatly aid marketing, communication and relationship building with the INU segment. In addition, given that computer at home is predicted by innovativeness and college education, businesses will do well to target post-secondary students for low-cost computers at home and for internet access. There is some evidence of this in the US market where major computer makers, such as Dell, Apple, HP and Compaq, offer computers at discounts or low prices at the start of the school year. Such offers are frequently bundled with internet services from providers like AOL and Comcast. However, it is not entirely clear whether traditional retailers of goods such as apparel and electronics are also stepping in to promote the availability of computer and internet access to college-educated students at their homes or places of residence, such as college dormitories.

Public policy makers would also find our results useful in trying to reduce the digital divide. Availability of computer at home is the primary variable that separates INU from IU. Our dataset also suggests that computers are more likely to be in the homes of innovative people in the post-secondary educated sections of the IU/INU social system. While marketers and public policy makers cannot change demographics, they can try to communicate with the more innovative people in the INU sector who might be candidates to buy computers on easier financial terms. In other words, providing poorer sections with computers at home on easy financial terms can help bridge the digital divide, particularly if the more innovative among the poorer, less educated and older population are targeted. The conversion of an IU to an OB is particularly profitable to the pure play internet business (e.g. amazon.com) and also to whole sections of organisations who would like to offer customer service, securely, online. This is because such firms do not generate any sales offline. Our research indicates that online trust is the single most important variable that differentiates an IU from an OB consumer. Considerable research now exists with respect to the generation of e-trust (Merrilees & Fry 2003; Ha 2004). Consumers want to know the privacy policy of the online retailer, particularly with respect to how their information will be used. In addition, the credit card transaction should be safe from misuse and the delivery of ordered product should occur as promised. Our research indicates that fear of double charging of their credit card is a primary concern for the IU–OB transition. Online retailers might want to highlight their technological safeguards, which will prevent the same transaction being inadvertently repeated. Credit card companies might have statements that highlight internet transactions separately. In addition, credit card companies today offer indemnity to the cardholder for any transactions that might be disputed by the consumer. These seem to be steps in the right direction to facilitate trust among IU.

Future research directions primarily rest on our formulation of the internet diffusion problem. We need to appreciate that, even within the US, there are pockets of poverty, as evidenced in the Katrina floods that struck New Orleans in 2005. In these pockets the INU proportions are likely to be much higher than in, say, affluent Fairfield County, Connecticut or Orange County, California. Similarly, at the global level there would be marked differences between developed and developing countries with respect to INU, IU and OB. Our survey would need to be replicated on a

random sampling basis across different populations to make the findings more generalisable.

The second variable to study could be the impact of developments in technology hardware on internet adoption. High-speed internet versus dial-up speeds seems to create another digital divide according to Pew Research (www.pewinternet.org). Clearly, with developments in internet access devices, differentiating variables will change in each market. For example, inexpensive wireless devices that allow economic and simple internet access may draw large numbers of INU into the IU category. Similarly, smartcard technology and greater ethics in business might actually make credit card transactions seem less risky and draw more IU into the OB category.

The third research direction would be to study the impact of changing business and societal processes on internet adoption. Examples include electronic check-in at airports, self-checkout at grocery stores, filing prescriptions online, electronic voting machines and e-filing of tax returns. As everyday societal processes have increasing amounts of the technology component, internet adoption for both the transition to IU and to OB will continue to change.

The fourth research direction would be to investigate the moderating effects of online trust. The questionnaire items for online trust would need to be appropriately augmented to determine what website features or brand features might help generate more online trust. Additionally, interesting questions in the online trust domain would be to examine how online trust facilitates taking up of complex activities like online stock trading. Also, measuring the impact of industry and government efforts to build online trust is an important area of future research.

In summary, our research has recast the internet diffusion problem as a two-stage diffusion model in two different social systems (i.e. the INU/IU system and the IU/OB system). Reviewing the literature we identified the variables that might help in the transition of INU to IU and the conversion of an IU to OB. We found that different variables seem to affect the two kinds of transition. By using our theoretical reconceptualisation of the internet diffusion problem we believe that academic researchers, marketing managers in traditional domain firms, public policy makers and online retailers will do a more effective job of utilising key variables as internet diffusion progresses further in society.

Appendix 1 Construct items

Construct name/(hypothesis)	Dimensions	Items
Innate innovativeness (H1)	Innovative explorer	<ul style="list-style-type: none"> a Would like a job that requires frequent changes from one kind of task to another b Often try new brands before your friends and neighbours do c Like to experiment with new ideas even if they turn out later to be a total waste of time d Don't like to talk to strangers
	Risk averse	<ul style="list-style-type: none"> a In hunting for the best way to do something, it is usually a good idea to try the obvious way first b Would like to wait until something has been proven before you try it c When it comes to taking chances, you would rather be safe than sorry d Enjoy being with people who think like you do
Offline innovativeness in purchase and consumption (H2)	Exploratory acquisition of products (EAP)	<ul style="list-style-type: none"> a You would rather stick with a brand you usually buy than try something you are not very sure of b You think of yourself as a brand-loyal consumer c When you go to a restaurant, you feel it is safer to order dishes you are familiar with d You usually eat the same kinds of foods on a regular basis
	Exploratory information seeking (EIS)	<ul style="list-style-type: none"> a Reading mail (postal) advertising to find out what's new is a waste of time b You like to go window-shopping and find out about the latest styles c You don't like to talk to your friends about your purchases d You often read advertisements just out of curiosity
Demographic (H3)		<ul style="list-style-type: none"> a Age group b Highest educational qualifications c Monthly household income
Computer at home (H4)		<ul style="list-style-type: none"> a Computer at home?

(continued)

Appendix 1 Construct items (continued)

Construct name/(hypothesis)	Dimensions	Items
Internet use (H5)	Online fun	a e-mail b Chat group c Surfing for fun
	Online work	a Reference/research materials b Job search c Travel information d Internet banking
Online trust (H6)	Personal information	a Will not give true personal particulars like name, address on the internet b Do not trust companies on the internet c The problem with internet is that we cannot touch and feel the products d You are afraid of being charged double on the internet when using credit card e You are afraid that personal particulars can be misused on the internet f You are afraid of computer hacker stealing credit card number on internet
	Site security	g If you already know the company, internet transactions are safe h Information on the internet is generally accurate i Internet sites are reliable j On the whole, you trust the internet

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