

# **Explaining Internet Banking Behavior: Theory of Reasoned Action, Theory of Planned Behavior, or Technology Acceptance Model?<sup>1</sup>**

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A key objective of information technology (IT) research is to assess the value of technology for users and to understand the factors that determine this value in order to deploy IT resources better. This paper uses structural equation modeling to ascertain the extent to which 3 popular models of users' behavior—theory of reasoned action (TRA), theory of planned behavior (TPB), and technology acceptance model (TAM)—are predictive of consumers' behavior in the context of Internet banking. Unlike other tests of these models, this paper employs independent measures of actual behavior, as well as behavioral intention. The results indicate that TAM is superior to the other models and highlights the importance of trust in understanding Internet banking behavior.

Explaining user acceptance of new technology is often described as one of the most mature research areas in the modern-day information technology (IT) literature (e.g., Hu, Chau, Sheng, & Tam, 1999). Researchers in past years have approached technology acceptance from many levels. Some researchers have examined this issue at the firm level by assessing the relationship between IT expenditure and performance (e.g., Banker, Kauffman, & Mahmood, 1993).

A second approach has been to examine the determinants of IT adoption and use by individual users (e.g., Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). As a key dependent variable in the IT literature, understanding use is of increasing theoretical interest. In recent years, a variety of theoretical perspectives have been applied to provide an understanding of the determinants of IT adoption and use, including the intention models from social psychology (Christie, 1981; Swanson, 1982). This stream of research uses behavioral intentions to predict actual use and, in turn, focuses on identification of the determinants of intention. The theory of reasoned action (TRA;

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Fishbein & Ajzen, 1975) and the theory of planned behavior (TPB; Ajzen, 1991) are especially well researched intention models that have proven successful in predicting and explaining behavior across a wide variety of domains. From this stream of social psychology research, the technology acceptance model (TAM; Davis 1989), an adaptation of TRA, has emerged as a powerful and parsimonious way to represent the antecedents of technology use. These multi-attribute models have long dominated attempts to predict technology acceptance behavior (e.g., Chau & Hu, 2001; Gefen, 2002; Gefen & Straub, 2000; Igbaria, Iivari, & Maragahh, 1995; Szajna, 1994).

The critical methodological examination reported in the present paper is a combination of a theoretical critique of these models and an empirical investigation of Internet banking behavior. The present study is concerned with both the theoretical status of the models under review and the sphere of human behavior in which they are applied. Therefore, the context of investigation is of central importance to the interpretation of the results. Before introducing the theoretical critique of these models, therefore, it is necessary to summarize briefly the context of Internet banking in the UK, where the empirical work was undertaken.

The conventional focus of Internet banking research is shifting from technological developments to customer behavior. Previous research on Internet banking has pointed out that customer acceptance is the key factor in the future development of Internet banking and has called for further research that facilitates a comprehensive understanding of this customer-based electronic revolution (Lassar, Manolis, & Lassar, 2005). To develop a deeper understanding of the relationship between customers' beliefs and Internet banking acceptance, the next section discusses important theories of technology acceptance.

### Multi-Attribute Models in the Context of Technology Acceptance

#### *Theory of Reasoned Action*

The TRA (Fishbein & Ajzen, 1975) is a well established social psychological model that is concerned with the determinants of consciously intended behaviors. From a theoretical point of view, the TRA is intuitive, parsimonious, and insightful in its ability to explain behavior (Bagozzi, 1982). The TRA assumes that individuals are usually rational and will consider the implications of their actions prior to deciding whether to perform a given behavior (Ajzen & Fishbein, 1980).

According to the TRA, presented in Figure 1, behavioral intention is the immediate antecedent of an individual's behavior. According to Ajzen and

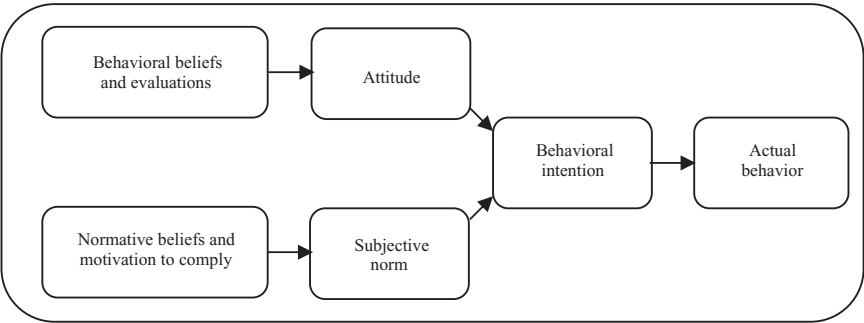


Figure 1. Theory of reasoned action (Fishbein & Ajzen, 1975).

Fishbein (1980), the TRA posits that “most behaviors of social relevance are under volitional control and are thus predictable from intention” (p. 41). The theory also suggests that because many extraneous factors influence stability of intention, the relationship between intention and behavior depends on two factors: (a) the measure of intention must correspond to the behavioral criterion in action, target, context, and time; and (b) intention does not change before the behavior is observed (Ajzen & Fishbein, 1980).

The TRA specifies that behavioral intention is a function of two determinants: a personal factor termed attitude toward behavior, and a person’s perception of social pressures termed subjective norm (Fishbein & Ajzen, 1975). *Attitude* refers to the person’s own performance of the behavior, rather than his or her performance in general (Fishbein & Ajzen, 1975). *Subjective norm* is a function of a set of beliefs termed normative beliefs. According to Ajzen and Madden (1986), normative beliefs “are concerned with the likelihood that important referent individuals or groups would approve or disapprove of performing the behavior” (p. 455). According to the TRA, to obtain an estimate of a subjective norm, each normative belief of an individual is first multiplied by motivation to comply with the referent and the cross-product is summed for all salient referents.

The TRA is a general model and, as such, it does not specify the beliefs that are operative for a particular behavior (Davis et al., 1989). Thus, the researcher using the TRA must first identify the beliefs that are salient for participants regarding the behavior under investigation. Furthermore, the TRA deals with the prediction, rather than outcome of behaviors (Foxall, 1997). In the TRA, behavior is determined by behavioral intentions, thus limiting the predictability of the model to situations in which intention and behavior are highly correlated.

The highest correlates between intention and behavior are found where the temporal gap between their expression is minimal. To take the extreme

case of overcoming this, however, measuring intention and behavior simultaneously fails to ensure a true test of the model's power to predict the future. At best, it corroborates the attitudinal basis of current behavior. Davies, Foxall, and Pallister (2002) suggested that in order to test TRA, actual behavior should be measured objectively, and unobtrusively, without signaling in any way its connection to the prior intention measurement phase. A further requirement of the TRA is that behavior must be under volitional control. Hence, the TRA is ill equipped to predict situations in which individuals have low levels of volitional control (Ajzen, 1991).

### *Theory of Planned Behavior*

The theory of planned behavior (Ajzen, 1991), an extension of the TRA, tackles the original model's limitations in dealing with behaviors over which people have incomplete volitional control. The TPB suggests that in addition to attitudinal and normative influence, a third element, perceived behavioral control (PBC), also influences behavioral intentions and actual behavior (see Figure 2).

The TPB extends the TRA to account for conditions in which individuals do not have full control over the situation. According to the TPB, human action is guided by three kinds of considerations: (a) behavioral beliefs about the likely outcomes of the behavior and the evaluations of these outcomes; (b) normative beliefs about the normative expectations of others and the

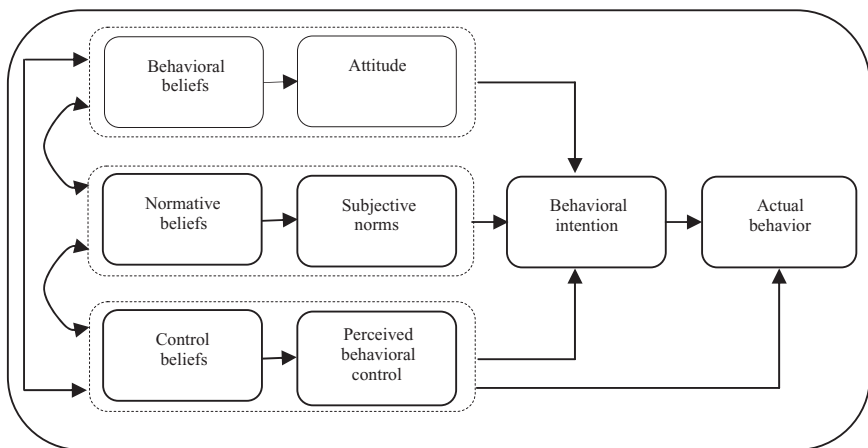


Figure 2. Theory of planned behavior (Ajzen, 1991).

motivation to comply with these expectations; and (c) control beliefs about the resources and opportunities possessed (or not possessed) by the individual and also the anticipated obstacles or impediments toward performing the target behavior (Ajzen, 1991). In their respective aggregates, behavioral beliefs produce a favorable or unfavorable attitude toward the behavior; normative beliefs result in perceived social pressure or subjective norm; and control beliefs give rise to PBC.

The TPB is, nevertheless, problematic on several grounds. First, like the TRA, the TPB assumes proximity between intention and behavior; thus, the precise situational correspondence is still vital for accurate prediction (Foxall, 1997). As Eagly and Chaiken (1993) pointed out, the assumption of a causal link between PBC and intention presumes that people decide to engage in behavior because they feel they can achieve it. Second, the operationalization of the theory is troubled by the problem of measuring PBC directly, as opposed to recording control beliefs (Davies et al., 2002; Manstead & Parker, 1995). Third, the theory introduces only one new variable when there is continuing evidence that other factors add predictive power over and above the measures formally incorporated in the TPB (Davies et al., 2002). For example, Manstead and Parker argued that personal norms and affective evaluation of behavior may account for variance in behavioral intentions beyond that accounted for by the TPB (cf. Davies et al., 2002). Ajzen (1991) himself described the model as open to further expansion:

The theory of planned behavior is, in principle, open to the inclusion of additional predictors if it can be shown that they capture a significant proportion of the variance in intention or behavior after the theories' current variables have been taken into account. (p. 199)

### *Technology Acceptance Model*

Originally developed by Davis (1989), the technology acceptance model (TAM) has emerged as a powerful and parsimonious model (Yousafzai, Foxall, & Pallister, 2007a, 2007b). Depicted in Figure 3, the TAM adapts the framework of the TRA and hypothesizes that a person's acceptance of a technology is determined by his or her voluntary intention to use that technology. Intention, in turn, is determined by the person's attitude toward the use of that technology and his or her perception concerning its usefulness.

Attitudes are formed from the beliefs a person holds about the use of the technology. The first belief, *perceived usefulness* (PU), is the user's "subjective probability that using a specific application system will increase his or her job

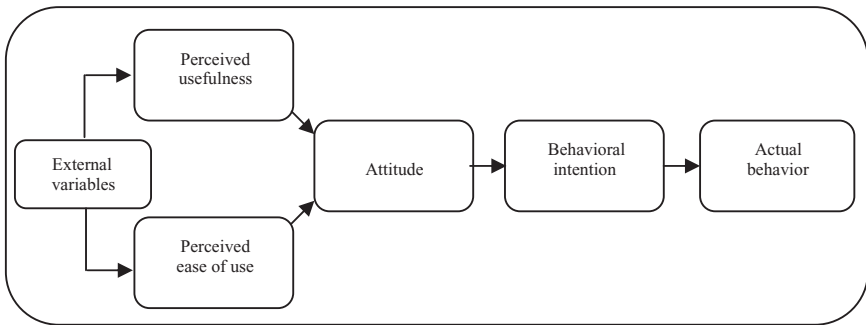


Figure 3. Technology acceptance model (Davis, 1989).

performance” (Davis et al., 1989; p. 985). Initially defined in the context of one’s job performance, PU was later used for any common task in non-organizational settings (e.g., Internet shopping; Gefen, 2002). The second belief, *perceived ease of use* (PEU), is “the degree to which the user expects the target system to be free of efforts” (Davis et al., 1989; p. 985). PU is influenced by PEU. As is the case for the TRA and TPB, the strength of such belief–attitude–intention–behavior relationships in predicting behavior largely depends on the degree of measurement specificity attained (Ajzen & Fishbein, 1980). In order to apply these notions to the technology acceptance context, it is necessary to measure beliefs regarding the use of technology, rather than the technology itself; that is, individuals might hold a positive view about a technology without being favorably disposed toward its use.

On the basis of a longitudinal study designed to test the original TAM empirically, Davis et al. (1989) proposed a revised model that they claimed was more “powerful for predicting and explaining user behavior” (p. 997). The attitudinal construct was removed because of the partial mediation by this construct of the impact of beliefs on intentions; the authors’ decision to excise attitude was corroborated, moreover, by their finding of only a weak direct link between PU and attitude and a strong direct link between PU and intentions. PEU, moreover, had a small effect on intention that subsided over time.

Originally developed to test the acceptance of word-processor technology (Davis et al., 1989), the TAM has since been extended to e-mail, voice mail, database management systems (DBMS; Szajna, 1994), personal computers (Igbaria et al., 1995), the World Wide Web (Gefen & Straub, 2000), and telemedicine technology (Chau & Hu, 2001), among others. The widespread popularity of the TAM can broadly be attributed to three factors: (a) it is parsimonious, IT-specific, and designed to provide an adequate explanation

and prediction of a diverse user population's acceptance of a wide range of systems and technologies within varying organizational and cultural contexts and expertise levels; (b) it has a strong theoretical base and a well researched and validated inventory of psychometric measurement scales, making its use operationally appealing; and (c) it has accumulated strong empirical support for its overall explanatory power (Mathieson, 1991; Szajna, 1996).

Previous research on the TAM has found little similarity between self-reported (i.e., subjective) and computer-recorded (i.e., objective) measures of IT use (Straub, Limayem, & Karahanna, 1995; Szajna, 1996). To be an effective surrogate, self-reported use must be a valid measure of use correlating strongly with other methods of measuring use (i.e., convergent validity; Nunnally, 1978). In addition, it should correlate more strongly with another method of measuring the same construct (e.g., actual use) than with another construct using the same measuring method (e.g., intentions), that is, discriminant validity. However, both Straub et al. (1995) and Szajna (1996) found a weak correlation between self-reported and actual use. Szajna also found that the correlation of self-reported use with intention was higher than its correlation with actual use, providing little support for discriminant validity.

Weak support for discriminant validity was a result of the fact that all constructs of the TAM are self-reported and when correlated with self-reported use, common-method variance becomes an important factor. Straub et al. (1995) argued that "research that has relied on subjective measures for both independent variables . . . and dependent variables, such as system use . . . may not be uncovering true, significant effect, but mere artifacts" (p. 1336). Another key limitation of the TAM is that while it provides a valuable insight into users' acceptance and use of technology, it focuses only on the determinants of intention (i.e., PU and PEU) and does not tell us how such perceptions are formed or how they can be manipulated to foster users' acceptance and increased use (Mathieson, 1991).

### Comparison of the Three Models

#### *Degree of Generality*

The first difference among the three models is their varying degree of generality (Mathieson, 1991). The TAM hypothesizes that PU and PEU are always the primary determinants of use decisions, while the TRA and the TPB use situation-specific beliefs. Therefore, for the TRA and the TPB, identifying salient beliefs specific to each context is part of the standard methodology for using the models, while it is not essential for the TAM. In

addition, the TPB and the TRA are more difficult to apply across different contexts than is the TAM, since the TRA and the TPB require pilot studies to identify different relevant outcomes, reference groups, and control variables (Mathieson, 1991).

Researchers have debated the relative advantages and disadvantages of deriving scales from elicited beliefs, as proposed in the TRA and the TPB, as opposed to using general beliefs similar to those identified by the TAM. The arguments in favor of generic beliefs suggest that in order to make the approach consistent and cumulative, and to save time, researchers should use a generic set of beliefs (Davis, 1989; Karahanna & Straub, 1999). In contrast, the eliciting of specific beliefs provides a greater guarantee that the beliefs will be relevant to the population and that intervention strategies may be properly targeted at the key issues (Ajzen & Fishbein, 1980). The debate over which method is better remains open and may depend largely on whether the researcher's prime focus is with prediction or explanation. Karahanna and Straub, for instance, used both methods and found that the general measures predicted behavior as well as, if not better than, beliefs elicited for a specific situation. Mathieson (1991) reported that while the TAM was a slightly better predictor of intention, the TPB showed better explanatory power because of its incorporating specific, rather than generic beliefs.

### *Social Variables*

The incorporation of social variables reveals a further difference in emphasis among the three models. Davis et al. (1989) did not include social norms in the TAM on the basis that they are not independent of outcomes. However, social variables can be important if they capture variance that is not already explained by other variables in the model (Mathieson, 1991). There could be social effects that are not directly linked to job-related or usefulness-related outcomes. This motivation is more likely to be captured by the TRA and the TPB than by the TAM.

In the IT literature to date, the role of subjective norm as a determinant of IT use is somewhat unclear. Neither Davis et al. (1989) nor Mathieson (1991) found a significant relationship between subjective norm and intentions. However, studies in organizational settings have found subjective norm to be an important determinant of intention or self-reported use of IT (e.g., Hartwick & Barki, 1994).

### *Behavioral Control*

Another major difference among the three models is their measurement of skills, opportunities, and resources needed to engage in a particular



behavior (i.e., PBC; Mathieson, 1991). Ajzen (1991) differentiated between internal control factors that are characteristics of the individual (e.g., skill, willpower), and external control factors that are specific to each situation (e.g., time, opportunity, cooperation of others). The TAM employs perceived ease of use (PEOU) to describe the internal control factors but does not explicitly consider the external factors. Hence, the TAM is less likely to identify the distinctive barriers to use since it is designated to operate across many situations. In contrast, the TPB is more likely to capture the situation-specific factors as it first identifies the important control variables for each situation.

### *Prediction and Explanation*

The TAM, the TRA, and the TPB were developed to explain and predict behavior. Each of these models, therefore, identifies the determinants of intention and behavior and details the pattern and direction of the causal influences among the variables. However, explanation and prediction mean different things, and prediction can occur independent of explanation, but the same is not true about explanation itself. Therefore, the explanatory power of these models can only be shown once prediction is established as being accurate.

Many of the studies incorporating the TAM have focused solely on the determinants of intention to use an information system. By doing so, these studies have not validated their models with respect to the prediction of actual behavior and, consequently, are unable to show that the explanation is valid for the behavior of interest. Davis et al. (1989), in their comparison of the TRA and the TAM, reported that the TAM predicted the use of a word-processing package better than did the TRA. Similarly, Mathieson (1991) found that the TAM predicted intentions better than the TPB. However, Taylor and Todd (1995), in their comparison of the TAM, the TPB, and the decomposed theory of planned behavior (DTPB), reported that the TPB predicted intention slightly better than the TAM. Thus, if the central goal of the study is to predict use, then it can be argued that is preferable (Taylor & Todd, 1995). However, the TPB does have a slightly higher explanatory power as a result of its inclusion of constructs such as subjective norm and PBC.

### *Measurement Instruments*

The availability of sound instruments is an important property of the TAM, since it simplifies the comparison of results across studies and supports

cumulative theoretical development. The original instrument for measuring PU and PEU was developed and validated by Davis (1989) and Davis et al. (1989), and was replicated by Mathieson (1991) and Hendrickson, Massey, and Cronan (1993). The scales have also exhibited a high degree of reliability, as well as convergent, discriminant, and nomological validity (Doll, Hendrickson, & Deng, 1998).

### *Parsimony*

While all three models are relatively parsimonious, the 5-variable TAM is more parsimonious than are the 6-variable TRA and the 8-variable TPB. In fact, the TPB, with 6 determinants of intention is considered to be twice as complex as the TAM, which has only 3 determinants of intention. Taylor and Todd (1995) found that while the 5-construct TAM explained 34% of the variance in use, the 13-construct DTPB explained 36%, a modest increase. So, the small increase in predictive power comes at the cost of a large increase in complexity. For practical applications of the models, parsimony may be more heavily weighted, while in pursuing a fuller understanding of the cognitive determinants of technology acceptance, a degree of parsimony can be sacrificed (Taylor & Todd, 1995). Thus, in general, the TAM maintains a greater degree of parsimony by sacrificing some explanatory power and is less costly to apply in most contexts.

### *Role of Trust in Internet Banking Acceptance*

The banking industry is strongly associated with high levels of trust related to security and privacy issues in the physical environment. However, this association has not yet been fully exploited in the realm of electronic consumer behavior. The impersonal interaction necessitated by the physical separation of bank personnel and their customers engenders a unique environment in which matters of trust assume a vital importance.

Customers may be reluctant to adopt Internet banking because of security and privacy concerns (Lee & Turban, 2001). Lack of customer trust, both in the attributes of the bank and in the overall online environment has been and remains an obstacle to the more widespread adoption of Internet banking. Customers' trust is identified as an important future challenge for Internet banking (Aladwani, 2001). Banks can build mutually valuable relationships with their online customers through a trust-based collaboration process (Dayal, Landesbeg, & Zeisser, 1999). However, the way in which trust may be gained and the impact it has on Internet banking is not yet well understood

(Jones, Wilikens, Morris, & Masera, 2000). Trust in Internet banking is a new and emerging area of interest in the field of marketing of financial services research.

Although research on trust as related to Internet banking is, furthermore, scarce and focused on more general issues of e-commerce, there is evidence that trust in this context should be treated as a multidimensional concept (Gefen, 2002). The present study treats the perceptions of privacy and security as antecedents of trust because research has asserted customers' concerns of privacy and security as leading barriers to online trust (Hoffman, Novak, & Peralta, 1999). Cheskin Research (1999) suggested that the "first and most necessary step" in establishing customers' trust is to provide them with the guarantee that their personal information will be safeguarded. Other researchers have also reinforced this belief, affirming that only after security and privacy concerns have been addressed will customers consider other Web features to determine the extent to which they can trust or feel comfortable transacting with the Web merchant (e.g., Benassi, 1999; Dayal et al., 1999).

Belanger, Hiller, and Smith (2002) pointed to the deficiency of existent e-commerce literature for conceptualizing security and privacy as distinct issues. This paper treats privacy and security as two separate constructs, and they are defined similarly to the distinction used in identifying environmental control as separate from control over secondary use of information (Hoffman et al., 1999). Environmental control concerns customers' reactions to the electronic transfer of their personal information and results from perceived and actual threats to online security, whereas control over the secondary use of information is concerned with banks' maintenance of privacy with respect to their customers' information. It is proposed that customers will develop trust on Internet banking transactions when they believe that their information will not be viewed, corrupted, or stored during transactions by parties other than the bank (i.e., perceived security); and that the collection, subsequent access, use and disclosure of their information will be consistent with their expectations (i.e., perceived privacy). This suggests that customers' perceptions of security and privacy are positively related to their trust.

### *Perceived Security*

Security has been widely recognized as one of the most significant barriers to the adoption of Internet banking (Aladwani, 2001; Daniel, 1999). Security in e-commerce is being defined as a threat that creates "circumstance, condition, or event with the potential to cause economic hardship to data or

network resources in the form of destruction, disclosure, modification of data, fraud, and abuse" (Kalakota & Whinston, 1997, p. 88). In the present study, *perceived security* is defined as customers' perceptions of the degree of protection against the aforementioned threats.

Security can be enhanced by the use of adequate encryption, digital signatures, and firewalls (Bhimani, 1996). However, consumers' perceptions of online security raise different concerns. Even if it is feasible to measure the degree of security objectively in every transaction, it is unclear whether this measurement would readily correspond to consumers' perceptions of security. In the risky environment of e-commerce transactions the objective, scientific perspective is usually different from the subjective, intuitively grounded one (Schenk, Vitalari, & Davis, 1998).

The present study measures customers' subjective perspectives about secure Internet banking transactions, based on their perceptions of timely, accurate, and safe data transmission. Following Ratnasingham (1998), it is proposed that when a customer develops positive perceptions of security, the trust and confidence in the relationship will also increase and will promote open, substantive, and influential information exchange.

### *Perceived Privacy*

Perceived privacy is the consumer's ability to control (a) the presence of other people in the environment during a transaction; and (b) banks' dissemination of customer-provided information only in accordance with the consumer's wishes (Goodwin, 1991). Hence, the present study defines *perceived privacy* as customers' perceptions regarding their ability to monitor and control the collection, use, disclosure, and subsequent access of their information provided to the bank during an online transaction. The conventional marketing approach suggests that expressions of control (awareness of information collected and its use) are the predominant influences on the degree to which customers experience privacy concerns (Sheehan & Hoy, 1999).

Consumers in online environments perceive little control over information privacy, and this has a striking influence on their willingness to engage in trusting relationships with Web merchants. Using customers' data for purposes other than the original transaction is seen as an invasion of their privacy and an illegitimate use of information on the part of the company. Financial services customers are more reluctant to use these services from fear that their financial life will become an open book to the Internet universe (Bestavros, 2000). Thus, there is a risk of loss of privacy, which is a significant factor in building trust.

The literature has described the willingness to assume the risk of disclosure as a dimension of trust (Nowak & Phelps, 1997). Accordingly, by disclosing privacy practices, banks can significantly ease customers' privacy concerns and can build a more trusting environment for online transactions. Trust arising from perceived privacy could best be achieved by allowing the balance of power shift toward a more cooperative interaction between online business and its customers (Hoffman et al., 1999). At a minimum, it means market-driven industry acceptance, enforcement of opt-out policies, and recognizing customers' rights to data ownership.

## Method

### *Models Comparison*

The previous sections reviewed and compared three principal theoretical models used in technology acceptance research. It appears that there are only seven model comparison studies in the literature (Chau & Hu, 2001; Davis et al., 1989; Gentry & Calantone, 2002; Mathieson, 1991; Plouffe, Hulland, & Vandenbosch, 2001; Riemenschneider & Hardgrave, 2000; Taylor & Todd, 1995). These comparisons focused on student and workplace mandatory settings and measured either intention or subjective use behavior.

The present study compares the TRA, the TPB, and the TAM in the context of objectively measured Internet banking behavior, attempting to seek answers to the following questions: Will existing behavioral models work in an environment that they were not developed to describe? Which of these three models best explains actual Internet banking behavior? Answering these questions requires a fair comparison; that is, a comparison that is not biased in favor of one model or another.

### *Ensuring a Fair Comparison*

It is important to consider whether models are theoretically comparable before they are empirically compared (Natarajan & Warshaw, 1991). Since the TPB and the TAM are derivatives of the TRA and consequently use many of the same constructs, an empirical comparison is justified. Further, the condition of procedural equivalence for a fair comparison was also maintained (Cooper & Richardson, 1986).

The first requirement for procedural equivalence is that the boundary conditions of the theories should be observed. The notable difference in boundary conditions is that the TRA and the TPB are more specific. In the

present study, a group of homogeneous participants (Internet banking users of the Halifax Bank of Scotland) indicated actual behavior (i.e., action) toward Internet (i.e., target) use for conducting their banking transactions (i.e., context) within a 2-month time period (i.e., time). This situation is specific enough for the TRA and the TPB, and also respects the boundary conditions of the TAM. Second, equal attention was given to measurement. The same measures were used for all models for attitude, intention, and actual use. The TAM constructs of PU and PEU were measured using an instrument developed by Davis (1989). Figure 4 shows the propositions that were evaluated, as well as the derivative hypotheses by means of which these theories will be tested.

*Proposition 1.* The TRA predicts Internet banking behavior.

- H1a. Intention to use Internet banking will significantly predict the actual use of Internet banking.
- H1b. Attitude toward the use of Internet banking and social normative influences will significantly predict intention to use Internet banking.

*Proposition 2.* The TPB predicts Internet banking behavior.

- H2a. Intention to use Internet banking and PBC will significantly predict the actual use of Internet banking.
- H2b. Attitude toward the use of Internet banking, social normative influences, and PBC will significantly predict intention to use Internet banking.

*Proposition 3.* The TAM predicts Internet banking behavior.

- H3a. Intention to use Internet banking will significantly predict the actual use of Internet banking.
- H3b. PU and PEOU of Internet banking will significantly predict intention to use Internet banking.

*Proposition 4.* All three models (TRA, TPB, and TAM) are appropriate to explain Internet banking behavior.

- H4a. TPB and TAM will explain more of the variance in Internet banking use than will TRA.
- H4b. TAM will explain more of the variance in Internet banking use than will TPB.

*Proposition 5.* The incorporation of trust will increase the sufficiency of TAM.

- H5a. Trust will have a positive influence on behavioural intention.
- H5b. Perceived privacy will have a positive influence on trust.
- H5c. Perceived security will have a positive influence on trust.

Figure 4. Propositions and derivative hypotheses to test the models. GFI = goodness of fit index; CFI = comparative fit index.

### *Questionnaire Development Process*

A postal questionnaire survey was used as the primary data-collection method. In the final study, a cover letter signed by the head of the Marketing Section of the business school and a letter of recommendation signed by a Senior Analyst in the e-Commerce Channel Development of Halifax Bank was sent, together with the questionnaire, to motivate potential respondents' participation in the research and to confirm the study's confidentiality and credibility. A postage-paid return envelope was enclosed.

Operationalization of the study's constructs is explained here. Respondents were asked to indicate agreement with each statement on a 7-point Likert-type scale ranging from 1 (*strongly agree*) to 7 (*strongly disagree*).

*Operationalization of Internet banking behavior.* Actual behavior for the use of six Internet banking services was computer-recorded by the bank over a period of 8 weeks. The Internet banking services were (a) basic account information and checking balance; (b) bill payment; (c) list of recent transactions; (d) viewing statement; (e) transferring money; and (f) setting up/canceling standing orders/direct debits.

The present study did not rely on self-reported behavior because its aim was to test the intention-behavior framework dictated by Ajzen and Fishbein (1980). In order to achieve this, it was critical that participants were unaware that both their actual behavior and intention to use were being monitored simultaneously. Researchers have observed that studies that have relied on subjective measures may not be uncovering true, significant effect, but mere artifacts (Straub et al., 1995).

*Operationalization of behavioral intention.* Ajzen and Fishbein (1980) argued that the strength of intention-behavior relationships depends largely on the degree of measurement specificity attained in a research project. Therefore, in order to apply these notions to the Internet banking context, intentions and beliefs were measured regarding the use of Internet banking, rather than directed toward Internet banking itself.

*Operationalization of attitude.* Following its definition in the context of the TRA, attitude was measured in terms of individual preferences and interests via feelings and evaluations regarding Internet banking outcomes.

*Operationalization of subjective norms.* In accordance with Ajzen and Madden's (1986) recommendations, subjective norms were operationalized by measuring normative beliefs and motivations to comply. Normative beliefs were measured by asking respondents to express their beliefs about whether specific others (i.e., friends, family, colleagues) thought Internet banking was important. Respondents' motivation to comply measured

their compliance with the wishes of their friends, family, and colleagues. A measure of subjective norm was then obtained by multiplying normative belief by motivation to comply and summing the resultant products.

*Operationalization of PBC.* Respondents' PBC was measured in terms of resources and opportunities possessed. This also considers the anticipated obstacles or impediments (Ajzen, 1991).

*Operationalization of PU and PEOU.* Operationalization of PU and PEOU was based on the original scale that was developed by Davis (1989).

*Operationalization of trust.* Trust was measured as a second-order construct and was operationalized as *overall trust* on service (Internet banking), entity (bank), and medium of transaction (Internet).

*Operationalization of perceived security.* Operationalization of perceived security was based on Ratnasingham's (1998) and Chellappa's (2003) definitions of e-commerce security, as the protection of information exchanged during electronic transaction from the threats and risks of transactional integrity, authentication, and authorization. *Transactional integrity* is the belief that the information will not be created, intercepted, modified, or deleted illicitly. *Authentication* belief assures customers that only genuine transactions will be worthy of acceptance. Finally, *authorization* belief establishes that the parties to an electronic transaction are who they claim to be.

*Operationalization of perceived privacy.* Operationalization of perceived privacy is based on the dimensions of awareness of information collection and information use beyond transaction, access, and enforcement (Chellappa, 2003; Smith, Milberg, & Burke, 1996; Stewart & Segars, 2002). *Access* refers to giving customers the right to verify or correct any information that they have already provided during online transactions. *Enforcement* ensures the existence of an effective mechanism to address any potential violations of customers' privacy.

### *Data Collection and Non-Response Bias*

Data were collected through questionnaires that were sent to 2,000 Internet banking users of Halifax Bank. Of those questionnaires, 441 completed questionnaires were received (response rate = 22.1%). Mann-Whitney-U and Wilcoxon-W test were conducted to check non-response bias, and the results yielded no significant differences ( $p < .05$ ) between the last-quartile and the first-quartile respondents.

The demographic profile of survey respondents (Table 1) shows that 190 (43.7%) were female and 245 (56.3%) were male. The largest age group consisted of those aged 26 to 45 years (41.6%), followed by those who were 46



Table 1

*Profile of Survey Respondents*

Category	<i>N</i>	%
Gender		
Male	245	56.3
Female	190	43.7
Age		
18–25 years	43	9.9
26–45 years	181	41.6
46–60 years	159	36.6
>60 years	52	12.0
Highest education		
Secondary school/college	177	40.7
Professional diploma	91	20.9
University (undergraduate)	83	19.1
University (postgraduate)	84	19.3
Occupation		
Student	21	4.8
Housewife/husband	26	6.0
Retired/pensioner	60	13.8
Professional	174	40.0
Clerical/secretarial staff	49	11.3
Technical staff	31	7.1
Self-employed	35	8.0
Others	39	9.0
Internet use		
Home	353	81.1
Office	82	18.9
Internet café	—	—
Internet experience		
<1 year	5	1.6
1–5 years	210	48.3
6–10 years	173	39.8
>10 years	45	10.3

Table 1 *Continued*

Category	<i>N</i>	%
Internet banking experience		
1–3 years	263	60.0
4–6 years	145	33.0
>7 years	27	6.0
Internet shopping		
Yes	406	93.3
No	29	6.7
Largest amount spent on Internet		
Nothing	29	6.7
<50£ (~\$78 US)	51	11.7
£51–100 (~\$79–\$156 US)	62	14.3
>£100 (~\$157 US)	293	67.3

to 60 years of age (36.6%). Average Internet experience of respondents was 2.6 years, and average Internet banking experience was 1.5 years.<sup>3</sup>

### *Data Analysis*

The data analysis was carried out in accordance with a two-step methodology of structural equation modeling (SEM) in which the measurement model is first developed and evaluated separately from the full structural equation model (Anderson & Gerbing, 1988).

### *Measurement Model*

Accordingly, the first step in the data analysis was to establish the unidimensionality, reliability, convergent validity, and discriminant validity of the

<sup>3</sup>We would have made a further check on non-response bias had it been possible to obtain such demographic data, as the age and gender of all 2,000 respondents who were approached. It would then have been open to us to compare the demographics of either the nonrespondents or all 2,000 with those of the respondents. Unfortunately, these data were not available. It was felt that the respondents must volunteer such personal information, rather than have the bank release it to us.

constructs with confirmatory factor analysis (CFA) using AMOS software (Version 5). Table 2 summarizes the CFA results.

Table 2 suggests that all standardized regression weights were greater than .60 and the critical ratios were significant ( $p = .001$ ). Adjusted chi square ( $\chi^2/df$ ) was 3.76, and other goodness-of-fit statistics indicate that the model achieved a good fit to the observed data, thus satisfying the conditions of unidimensionality. Turning to assessment of measures of reliability, Table 2 indicates that reliability in individual items based on  $R^2$  values for all indicators was greater than .50. In terms of composite values, the constructs exceeded Bagozzi and Yi's (1989) recommended value of .60. In addition, reliability evaluation based on average variance extracted (AVE) reveals that all constructs exceeded .50 (Fornell & Larcker, 1981). This implies that the variance captured by the construct was greater than the variance accounted for by measurement error. Furthermore, Cronbach's alpha values for all constructs exceeded .70. Concerning discriminant validity, Table 3 suggests that the correlation coefficients among the latent constructs did not exceed the cutoff point of .85. Additionally, comparison between the square root of AVE and correlations in Table 3 also establish discriminant validity.

### *Structural Model Results*

Following the satisfactory model evaluation results, this section uses SEM to examine and compare the TRA, TPB, and TAM to determine which model performs well in explaining Internet banking behavior. Table 4 summarizes the degree to which each model fit the data.

The fit statistics in Table 4 indicate that the TRA provides a poor fit to the data. The fit of the TPB is moderately comparable to the TAM, with a slightly better root mean square error of approximation (RMSEA), suggesting that even when the increased complexity of the TPB is taken into consideration, the fit of the TPB model is at least equivalent to that of the TAM. The TAM and the trust-enhanced TAM appear to be superior to the TPB and the TRA in explaining behavioral intention and actual use of Internet banking (TAM,  $R^2_{BI} = .75$ ,  $R^2_{Use} = .67$ ; TPB,  $R^2_{BI} = .39$ ,  $R^2_{Use} = .60$ ; TRA,  $R^2_{BI} = .37$ ,  $R^2_{Use} = .47$ ). Clearly, the trust-enhanced TAM not only provides the best fit to the data, with a comparative fit index (CFI) well above .90, it also explained 67% of the variance in actual behavior.

Table 5 shows the path coefficient for each model, together with the respective significance. The path significance was consistent across all investigated models. That is, a path found to be significant in one model remained so in the other models and, similarly, a path not significant in one model remained insignificant in the others. According to the TRA, TPB, and TAM,

Table 2

*Confirmatory Factor Analysis Results for Measurement Model*

Construct	Regression weight	$R^2$	$\alpha$	CR	AVE
Intention			.84	.91	.76
INT1	.75**	.64			
INT2	.85*	.73			
INT3	.80*	.60			
Attitude			.71	.80	.57
ATT1	.80**	.65			
ATT2	.62**	.78			
ATT3	.57**	.74			
PBC			.78	.80	.69
PBC1	.68**	.56			
PBC2	.86**	.74			
PBC3	.71**	.51			
Subjective norm			.74	.84	.71
SN1	.73**	.54			
SN2	.80**	.64			
Perceived usefulness			.89	.94	.79
PU1	.86**	.74			
PU2	.85**	.73			
PU3	.79**	.63			
PU4	.79**	.62			
Perceived ease of use			.93	.96	.83
PEU1	.77**	.60			
PEU2	.78**	.60			
PEU3	.84**	.70			
PEU4	.92**	.85			
PEU5	.94**	.89			
Trust			.92	.96	.88
TRST1	.94**	.81			
TRST2	.84*	.71			
TRST3	.90*	.95			

Table 2 *Continued*

Construct	Regression weight	$R^2$	$\alpha$	CR	AVE
Perceived security			.92	.94	.73
PSEC1	.61*	.52			
PSEC2	.62*	.58			
PSEC3	.73*	.53			
PSEC4	.69*	.84			
PSEC5	.91*	.83			
PSEC6	.88*	.77			
PSEC7	.95**	.90			
Perceived privacy			.81	.91	.76
PPRIV1	.61*	.47			
PPRIV2	.80*	.63			
PPRIV3	.90*	.82			
PPRIV4	.88**	.77			
PPRIV5	.61*	.47			

*Note.* CR = composite reliability; AVE = average variance explained; PBC = perceived behavioral control.  $\chi^2/df = 3.76$ . Goodness-of-fit index = .91; comparative fit index = .96; Tucker–Lewis Index = .94; root mean square error of approximation = .07.

\* $p < .01$ . \*\* $p < .001$ .

the immediate determinant of human behavior is behavioral intention. Results from the structural model (see Table 5) support this association for all models.

PU was a significant determinant of behavioral intention in both the TAM (.89) and the trust-enhanced TAM (.90). However, the relationship between intentions and PEOU was not statistically significant. PU was significantly predicted ( $R^2_{PU} = 50\%$ ) by PEOU (.56) in TAM. In addition, the path from PBC to behavioral intention was significant in the TPB. The path from subjective norm to behavioral intention was not significant in either the TPB or the TRA. The results also suggest a positive, albeit weak, association between attitude and behavioral intention. Finally, a total of 78.2% of variance in trust on Internet banking transactions was predicted by perceived security (.396) and perceived privacy (.271).

### Discussion

A major strength of the present study is that it studied actual, objective Internet banking behavior without signaling its relationship with the

Table 3

*Descriptive Statistics, Interconstruct Correlations, and Square Root of AVE*

Construct	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9
1. Behavioral intentions	3.35	1.32	.87								
2. Perceived usefulness	2.84	1.58	.42	.89							
3. Perceived ease of use	3.20	1.56	.33	.77	.91						
4. Trust	3.20	1.60	.61	.62	.60	.94					
5. Perceived security	3.77	1.59	.27	.58	.58	.76	.85				
6. Perceived privacy	3.65	1.67	.22	.44	.50	.59	.60	.87			
7. Subjective norm	2.77	1.27	.21	.29	.24	.21	.21	.21	.75		
8. Attitude	3.59	1.77	.34	.72	.60	.54	.50	.35	.46	.84	
9. PBC	2.84	1.58	.25	.55	.63	.62	.64	.74	.31	.75	.69

*Note.* AVE = average variance explained; PBC = perceived behavioral control. Diagonal elements depict the square root of AVE; off-diagonal elements depict the correlations between constructs.

intention measurement phase. Past research on technology acceptance has either indicated acceptance by inferring from respondents' intentions (in the sense that intention is positively related to actual use), or it has measured subjective self-reported actual behavior.

The present study contributes to the literature by supporting the proposition that behavioral intention to use IT does affect objectively measured future IT use. The results suggest that the TAM is superior to both the TRA and the TPB in explaining variance in actual behavior and in terms of model fit, at least within an Internet banking context. The results beg the obvious question as to why the TAM outperformed both the TRA and the TPB. A possible explanation could be the TAM's use of two specific beliefs (i.e., PU and PEOU), which can be applied to any technology acceptance context.

On the other hand, the TRA and the TPB require the researcher to "reinvent the wheel" and elicit unique beliefs for each situation. In addition, the TAM benefits by not considering the consistently unreliable (at least in

Table 4

*Overall Fit and Explanatory Power of the Models*

	Recommended value	TRA	TPB	TAM	TAM with Trust
Fit index					
$\chi^2/df$	$\leq 3.00$	5.86	4.59	2.90	2.10
CFI	$\geq .90$	.77	.87	.91	.95
GFI	$\geq .90$	.49	.79	.89	.94
RMSEA	$\geq .08$	.18	.07	.08	.07
Explanatory power					
$R^2_{Use}$		.37	.39	.51	.67
$R^2_{INT}$		.47	.60	.57	.75
$R^2_{PU}$		—	—	.50	.55

*Note.* TRA = theory of reasoned action; TPB = theory of planned behavior; TAM = technology acceptance model; RMSEA = root mean square error of approximation; INT = intention; PU = perceived usefulness.

terms of researchers' ability to capture consistently) construct of subjective norms. Since both the TAM and the TPB are advanced theories derived from the TRA, it was expected that these two theories would explain or predict actual behavior more accurately than the TRA. Finally, Internet banking is technology-related use behavior, and the TAM was specifically developed to explain such behaviors.

The present study provides empirical evidence that intentions translate over time into actual behavior—as assumed, but seldom shown, in e-commerce research—thus validating the practical utility of the proposed model. The results also suggest that integration of trust with the TAM constructs under the TRA aegis is not only theoretically appealing, but also empirically significant, since it explains why the variance for intention was much higher than indicated by previous TAM studies. The original conceptualization of the TAM was in keeping with that of the TRA, where beliefs (i.e., PU and PEU) were hypothesized to be completely mediated by attitudes toward using technology. However, a subsequent study conducted in a volitional environment confirmed the possibility of a direct belief–intention linkage and demonstrated that the explanatory power of the TAM is equally good, and it is more parsimonious without the mediating attitude construct (Davis et al., 1989). The results from the present study also confirm this

Table 5

*Significance and Strength of Individual Paths*

Hypothesized relationships	TRA	TPB	TAM	TAM with Trust
Behavioral intention → Actual use	.64**	0.63**	0.67**	0.67**
PBC → Actual use	—	0.40**	—	—
Attitude → Behavioral intention	.21*	0.27*	—	—
PU → Behavioral intention	—	—	0.89**	0.90**
PEOU → Behavioral intention	—	—	0.11	0.02
SN → Behavioral intention	0.17	0.18	—	—
PBC → Behavioral intention	—	0.43**	—	—
PEOU → PU	—	—	0.56**	0.56**
Trust → Behavioral intention	—	—	—	0.37**
Perceived security → Trust	—	—	—	0.40**
Perceived privacy → Trust	—	—	—	0.27**

*Note.* TRA = theory of reasoned action; TPB = theory of planned behavior; TAM = technology acceptance model; PBC = perceived behavioral control; PU = perceived usefulness; PEOU = perceived ease of use; SN = subjective norm.

\* $p < .01$ . \*\* $p < .001$ .

finding, thus suggesting any observed relationship between attitude and intention to be spurious.

Judged by its effect on intention, PU was found to be the most significant factor, confirming the possibility of extending TAM into the Internet banking context to explain its acceptance. However, the effect of PEU on intentions was not significant. A possible explanation could be given by Davis (1989), who argued that PEU may act indirectly on intentions through



PU. The results suggest that PEU has an indirect effect on intention via PU on which it has a strong direct effect, thus allowing the inference that PEU fosters the usefulness of Internet banking.

The nonsignificant link between PEU and intention was also consistent with prior research suggesting that ease of use initially influences potential adopters' use intentions (Gefen & Straub, 2000). Similarly, in many cases, the new technology is adopted because of its extrinsic aspect (captured through PU), and not its intrinsic aspect (Gefen & Straub, 2000). Thus, PEU will only affect use when the intrinsic character of the technology contributes to the actual outcome. The sample for the present study consisted of experienced Internet banking users, and as users gain experience with the technology, more cognitive considerations emerge and gain significance in determining the intended behavior.

The findings relating to trust reinforced the interpretation that trust, in the context of Internet-related behaviors, is a multidimensional construct. They also confirmed the presence and importance of two antecedents of trust: (a) the belief that there are safety mechanisms built into the website (i.e., perceived security); and (b) the belief that transaction information will not be used or shared with others without customers' consent (i.e., perceived privacy). The present study highlights the importance of using security and privacy as two distinct concepts, even though they are conceptually related.

This study has significant implications for research on online customer behavior. With the arrival of e-commerce, the notion of uncertainty is introduced into technology acceptance because customers are required to use the Internet in order to communicate, collaborate, and transact within and without organizational barriers, thus transcending secure, face-to-face interactions (Pavlou, 2003). While conventional customer behavior is well described by economic and marketing theories, overwhelming evidence suggests that technology-related variables have become as important as traditional factors in predicting online customer behavior (e.g., Jarvenpaa & Tractinsky, 1999; McKnight, Cummings, & Chervany, 1998; Pavlou, 2003). The findings from the present study suggest that it is crucial for customer behavior researchers to examine the role of uncertainty in situations in which trust and perceived risk are likely to affect system use; for example, virtual teams and organizations, interorganizational collaboration, and Business to Business (B2B)/Business to Consumer (B2C)/Consumer to Consumer (C2C) transactions.

The most significant implication for the banking sector is the need to recognize that Internet banking acceptance should be managed with the twofold objectives of creating a useful service and of building a trusting relationship with customers. While the explicit essence of the customer's relationship with the bank is to obtain useful, efficient Internet banking

service, the customer's trust and its antecedents are an essential aspect of this relationship and contribute to its value. Banks should build websites that are not only useful and easy to use, as TAM suggests, but should also include trust-building mechanisms (e.g., Yousafzai, Pallister, & Foxall, 2005).

There is always the issue of generalizability in customer behavior studies, and the present study is no exception. Future research must determine the extent to which the findings of the present study can be extended to include other persons, settings, and times. One way of doing this is to extend the work to lesser known Internet banking websites. The data for the present study were collected from a single High Street bank, and one that has a reputation as an established bank. The results might be different for pure play Internet banks, such as EGG ([www.egg.co.uk](http://www.egg.co.uk)) and CAHOOT ([www.cahoot.co.uk](http://www.cahoot.co.uk)), which do not have physical branches in towns and cities.

Second, the sample was comprised only of active Internet banking users. Whether these results can be generalized to non-users or to dormant users of Internet banking will require additional research. Third, the measures of all the constructs of the study, except for actual Internet banking use, were collected at the same point in time and via the same instrument, so the potential for common-method variance exists (Straub et al., 1995). There were, however, no signs of lack of discriminant validity among the principal constructs, which is the usual sign of common-method variance. Nevertheless, future research could employ a more controlled experimental manipulation to avoid allowing respondents to provide uniform responses across all constructs.

Finally, as a result of the cross-sectional nature of the study, causality can only be inferred through the theory. To show causation, additional longitudinal research, possibly even in a quasi-experimental design, is necessary (Cook & Campbell, 1979).

A topic that requires additional research is the conceptualization of trust. Additional research could include other aspects of trust that have been suggested, but that are not commonly applied; for instance, reliability and loyalty (Hosmer, 1995), and predictability (McKnight et al., 1998). Trust may also be influenced by a variety of other elements that are beyond the relationship itself, such as personality-related dispositions (e.g., disposition to trust, belief in humanity; McKnight et al., 1998), as well as vendor characteristics (e.g., size, reputation; Jarvenpaa & Tractinsky, 1999).

An important caveat arises in connection with our claims that we have made actual consumer behavior our dependent variable. It can be argued against this that since we surveyed only existing users of online banking, we failed to measure current acceptance of a new technology. We captured frequency of use of certain features of the product, rather than a more global conception of technology acceptance. It is important, therefore, not to over-

claim with respect to the prediction of technology acceptance conceived more globally. Nevertheless, our study measured technology acceptance as defined and operationalized by the authors of the TAM (Davis et al., 1989). There remains scope, however, for further research to survey current non-users of online banking and to determine on the basis of the TAM variables their propensity to adopt in future.

Another consideration that raises the desirability of continuing investigation stems from our use of existing customers. We have already acknowledged that customers must feel confidence in their online system's approach to privacy and security and, as a result, that it is incumbent on online banks to ensure a certain level of service in this regard before consumers will use them. We must assume, therefore, that our respondents, as current users of such a system, either did not care unduly about privacy and security or that the online system they had adopted already met their concerns.

The further consideration for investigation (which might usefully take the form of qualitative research) relates to consumers' comparative judgments of online, as opposed to physical banking. A customer's confidence in online banking cannot be inferred solely from his or her perceptions of and behavior toward that channel of distribution in isolation from its competitors: He or she may trust the physical banking system even less. Further study might address, for instance, consumers' trust of those individual bank employees whose low status in the workplace and relatively low income levels could appear to bank users to make them vulnerable to dishonesty.

Despite these limitations, however, the present study has several advantages over earlier studies. Not only was Internet banking behavior observed objectively, it was done in such a way that respondents who identified their intention to use Internet banking did not know that their actual behavior would be monitored. In addition, this study met the conditions set out by Ajzen and Fishbein (1980) for testing the TRA; that is, precise situational correspondence and continuity between behavior and intention.

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