

Contents lists available at [ScienceDirect](#)

Journal of High Technology Management Research



## Intention of use of home broker systems from the stock market investors' perspective

Luiz Antonio Joia <sup>a,\*</sup>, Luís Felipe Dantas Gutman <sup>b</sup>, Valter Moreno Jr. <sup>c</sup>

<sup>a</sup> Brazilian School of Public and Business Administration at Getulio Vargas Foundation, Brazil

<sup>b</sup> Veiga de Almeida University, Brazil

<sup>c</sup> Faculdades IBMEC and Rio de Janeiro State University, Brazil

### ARTICLE INFO

Available online xxxx

#### Keywords:

Home broker systems  
Stock market  
User satisfaction  
Information system adoption  
E-brokerage  
Brazil

### ABSTRACT

This research seeks to investigate the antecedents of stock market investors' intention to use web-based home broker systems. Based on a review of the literature on information system adoption models, diffusion of innovation theory, trust in virtual environments, and user satisfaction, a theoretical model is developed and research hypotheses are set forth to be tested. PLS multivariate analysis is employed to assess the proposed model with data collected via the web from 152 Brazilian investors. The results suggest that compatibility, perceived usefulness and perceived ease of use are antecedents of user satisfaction with home broker systems, which, in turn, is an antecedent of investors' intention to use the system. The paper concludes with academic and managerial implications, research limitations, and a research agenda for this important knowledge area.

© 2016 Elsevier Inc. All rights reserved.

### 1. Introduction

The main objective of this research is to ascertain the antecedents of the intention of use of home broker systems from the standpoint of the final users, namely stock market investors. According to [Davis, Bagozzi, and Warshaw \(1989\)](#) and [Legris, Ingham, and Collerette \(2003\)](#), a system that presents superior technical performance is meaningless if, for any reason, the users do not accept the available technology. Thus, understanding the reasons underlying acceptance of information systems has become one of the most challenging research fields in the Information Systems (IS) arena ([Davis et al., 1989](#); [Kim & Kankanhalli, 2009](#); [Venkatesh, Davis, & Morris, 2007](#)).

On the other hand, the current routine of BOVESPA (São Paulo Stock Market, Brazil) has been marked by an intense use of Information Technology (IT) in its operations. In Brazil, the deployment of home broker systems in 1999 enabled small and medium investors to take part in this market. A home broker system allows investors to transmit their purchase and sale orders directly to BOVESPA's trading system, via brokerage house websites. Based on this fact, the São Paulo Stock Market in Brazil has been operated exclusively via electronic auction since early 2006.

Moreover, according to the Clearing Facility and Central Securities Depository (CBLIC), the amount of brokerage houses in Brazil that have made home broker systems available has increased rapidly, from six in 1999 to more than 60 in the first semester of 2011. Besides, the top ten brokerage houses in Brazil traded, in total, in September 2011, more than US\$ 10 billion ([Gutman & Joia, 2012](#)).

\* Corresponding author at: Praia de Botafogo 190, room 526, Rio de Janeiro 22250-900, RJ, Brazil.  
E-mail address: [Luiz.joia@fgv.br](mailto:Luiz.joia@fgv.br) (L.A. Joia).

This scenario of growth of numbers of investors in the financial market, together with the evolution of the Internet, has transformed the home broker system into an important intermediation tool in this arena. However, the amount of research with a focus on home broker systems is still scarce (e.g. Balasubramanian, Konana, & Menon, 2003; Roca, Garcia, & De La Vega, 2009).

Therefore, this work seeks to answer the following research question: What are the antecedents of intention of use of home broker systems from the standpoint of stock market investors?

This article is structured as follows. After this introduction, the theoretical references used in this work are set forth and, in the next section, research hypotheses are proposed and a structural model is developed for testing. The methodological procedures adopted in this article to test the aforementioned model and research hypotheses are then explained. Based on that, the collected data are presented and analyzed and, in the next section, the results obtained are discussed. Lastly, the academic and managerial implications accrued from this research, the limitations of this work, as well as an agenda for further investigation are unveiled.

## 2. Theoretical references

### 2.1. E-brokerage

E-brokerage is the intermediation process between buyers and sellers enabled by the Internet. In this article, the e-brokerage concept is applied to the financial market, particularly to the process of buying and selling company stocks. As argued by Dasgupta and Dickinson (1998), the process of investing in the stock market comprises four steps, namely: (1) sending of a purchase order; (2) routing of this order up to its execution; (3) setting of a price; and (4) confirmation of the purchase order. With respect to the electronic process, according to Costa and Joia (2006), the investors input their purchase/sale order directly via their computers. The orders are then sent by the brokerage house to the Stock Exchange that seeks to match the purchase and sale prices in order to obtain the best bid.

Because the e-brokerage process needs less intermediary agents, costs are lower than the traditional brokerage fee, as the Internet enables companies to provide services via the network with little or no human intervention (Voss, 2000). According to Sharma and Bingi (2000), this cost reduction is passed on to the investor who usually has lower brokerage expenses for operating via home brokerage systems.

However, as supported by Roca et al. (2009), the modus operandi associated with stock trading via Internet-based systems is quite peculiar and specific, thereby justifying original research about this issue that not only aims to simulate online banking research. This is due to the dynamic characteristics of this process, as well as regulatory, legal, tributary and other frameworks associated with stock trading by individual investors. In line with this, Roca et al. (2009) argue that there are huge differences between online investing and online banking, suggesting that most of the models developed for Internet banking are not applicable unless they are adjusted to home broker systems. Lastly, Konana and Balasubramanian (2005) support that studies about the acceptance of online investing systems must be more holistic than studies about Internet banking adoption, so as to take into consideration several factors overlooked by the latter, one of these being investor satisfaction with the system.

### 2.2. Information systems acceptance models

Academics and practitioners of Information Systems (IS) have investigated the reasons behind user resistance to adopt an IS (Benbasat & Barki, 2007). Consequently, several approaches have been used to assess information systems, in order to forecast how users will respond to them, so as to improve their use. Among these approaches, one can highlight the Theory of Reasoned Action (TRA), the Theory of Planned Behavior (TPB) and the Technology Acceptance Model (TAM) with its various variants, as explained below.

#### 2.2.1. Theory of Reasoned Action (TRA)

The Theory of Reasoned Action (TRA), with its roots in the Social Psychology field, seeks to identify intentional and conscious behavior antecedents (Fishbein & Ajzen, 1975). The TRA assumes that people behave rationally, evaluating what they can gain or lose through their attitudes. Therefore, their ideas, personal goals, values, beliefs and attitudes influence their behavior. If, for instance, people believe that sharing knowledge will bring them benefits, they will support sharing behavior (Fishbein & Ajzen, 1975). Moreover, the behavior intention is also influenced by extant subjective norms, namely the perception people have that people who are important to them believe they are expected to behave in a certain way. Fig. 1 depicts the relationship among constructs in the Theory of Reasoned Action.

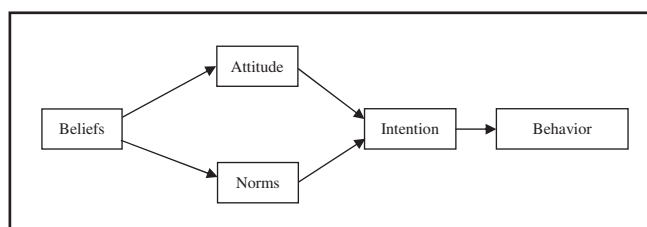


Fig. 1. Theory of Reasoned Action (TRA).  
Source: Fishbein and Ajzen (1975)

According to Davis et al. (1989), since TRA is so easy to generalize and integrates diverse theoretical perspectives of Psychology, its use is appropriate in studies about the critical success factors associated with the use of computers and information systems (IS) as well. When applied in this context, the TRA points out that a person's attitude in relation to the use of an information system, besides peer pressure, might influence their intentions to use the IS, as well as IT in general.

### 2.2.2. Theory of Planned Behavior (TPB)

While the TRA has been largely used to study user acceptance to computers and information systems, other theoretical perspectives were also proposed and applied in this realm. Ajzen (1991) proposes the Theory of Planned Behavior (TPB), which complements the TRA adding one more antecedent to the intention of using IS, namely perceived behavioral control. Due to this, the TPB has been applied in empirical research on acceptance of sundry computational systems (Venkatesh, Thong, & Xin, 2012).

The perceived behavioral control construct was added to the model in order to reduce potential flaws in the TRA in cases where individuals are not fully aware of their behavior. This construct is defined as the personal perception about the resources, available opportunities and information that might hinder or enable the behavior under analysis. Thus, the construct addresses both the internal control (e.g. personal capabilities) and external constraints (e.g. opportunities), considered as necessary for exercising given behavior (Cho & Cheung, 2003).

As Figs. 1 and 2 depict, the TRA and TPB have several similarities. In both models, intention is a key factor to explain behavior. Likewise, in both theories intention has the individual's attitudes and subjective norms as its antecedents, which are influenced by the individual's beliefs. Besides, both theories also assume that individuals are rational, thereby taking advantage of systematic use of information to make their decisions.

### 2.2.3. Technology Acceptance Model (TAM) and its variants

The TAM is the most used research model applied to assess Information Technology acceptance (Benbasat & Barki, 2007). It was proposed by Davis et al. (1989) to explain the reasons why users accept or reject IT, as well as to improve the acceptance of same. In the model, external factors related to technology impact on internal factors associated with individuals, such as attitudes and intention of use (Costa-Filho & Pires, 2005).

In essence, the TAM points out that IT acceptance is affected by two constructs associated with users, namely perceived usefulness (PU) and perceived ease of use (PEOU). The perceived usefulness is defined by Davis et al. (1989) as the extent users believe that the use of a system will improve their performance. As to the perceived ease of use, Davis et al. (1989) define it as the extent to which an individual believes that the use of a system is effortless. Davis et al. (1989) argue that these two perceptions ensure a favorable disposition or positive intention to use an Information System. Thus, the TAM points out that individuals will use an IS if they believe its use will bring them positive results in the form of perceived ease of use and usefulness (Igarria, Guimaraes, & Davis, 1995).

Fig. 3 depicts the Technology Acceptance Model as proposed by Davis et al. (1989).

From the original model, several other constructs have been added to TAM, leading to the development of TAM 2 (Venkatesh, 2000; Venkatesh & Davis, 2000), TAM 3 (Venkatesh & Bala, 2008) UTAUT (Venkatesh, Morris, Davis, & Davis, 2003), and several other variants (Venkatesh et al., 2012), in what has been called "TAM ++ research" by Benbasat and Barki (2007, p. 212). Notwithstanding the complexity of the current technology acceptance models derived from the original TAM, they are subject to criticism (e.g. Benbasat & Barki, 2007; Lee, Kozar, & Larsen, 2003), mainly for not considering other theoretical approaches to better explain technology adoption. This includes the Innovation Diffusion Theory (IDT), developed by Rogers (2003), and not taking into account the peculiarities of each technology, assuming that all of them are equal and thus capable of having their adoption explained by the same theoretical approach (Orlikowski & Iacono, 2001). According to the critics (Benbasat & Barki, 2007; Legris et al., 2003), these shortcomings have led the TAM and its variants to explain at most 40% of the variation in the attitude and intention of use of IS (Legris et al., 2003), thereby suggesting that important factors have been overlooked in the analyses conducted. In order to tackle these issues, other approaches will be presented below, aiming at increasing the explanation power of the TAM and its variants.

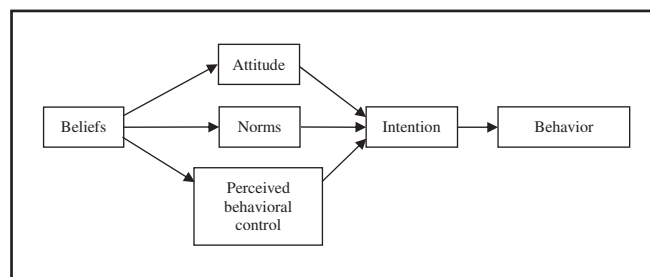


Fig. 2. Theory of Planned Behavior (TPB).  
Source: Ajzen (1991)

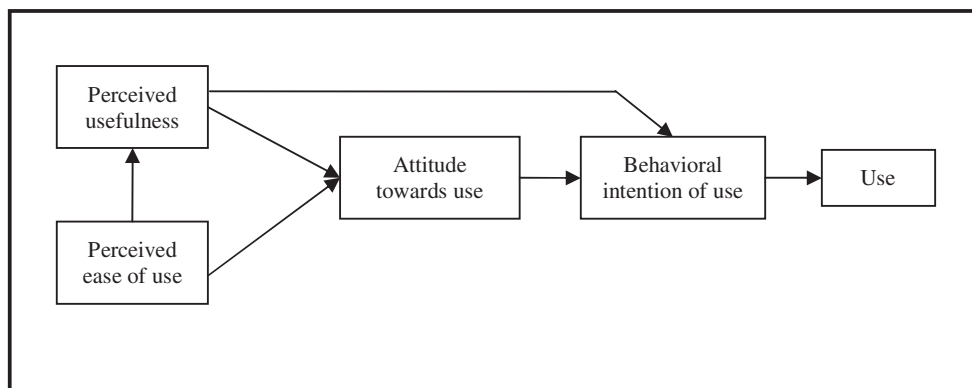


Fig. 3. Technology Acceptance Model (TAM).  
Source: Davis et al. (1989)

### 2.3. Innovation Diffusion Theory (IDT)

The Innovation Diffusion Theory (IDT) aims to explain the process by which technological innovations are adopted and diffused by users. According to Rogers (2003), innovation is an idea, practice or object that is perceived as new by an individual or another unit of analysis. Rogers (2003) also defines diffusion as the process by which an innovation is communicated via certain channels over time to members of a social system.

According to Rogers (2003), the IDT considers the following factors as antecedents of diffusion of large-scale innovation: relative advantage, compatibility, complexity, trialability, and observability. However, according to Chen, Gillenson, and Sherrell (2004), of these attributes only relative advantage, compatibility and complexity seem to be consistently associated with the adoption of technological innovation.

For Benbasat and Barki (2007), as the IDT can add more explanatory power to the original TAM, it should be taken into consideration in research into IT adoption. As explained further in this work, the model herein proposed tallies with this idea.

### 2.4. Trust

There are several definitions for trust, which reveals the complex nature of this construct. In a literature review encompassing several knowledge fields, Rousseau, Sitkin, Burt, and Camerer (1998) point out that one's personal expectations and propensity to feel vulnerable are critical components in all definitions concerning trust.

The most cited definition in the scientific literature of trust is the one proposed by Mayer, Davis, and Shoorman (1995), which is adopted in this work. In this definition, trust involves two agents – the one who trusts in someone and the one who is trusted by someone – being understood as “the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party” (Mayer et al., 1995, p. 712). This definition is based on the idea that the individual who trusts becomes vulnerable, which implies that something important can potentially be lost due to this trust relationship (Schlosser, White, & Lloyd, 2006).

In general, in the Internet arena, remote users from anywhere in the world can access files on computers. Thus, information traveling through home broker systems involves an inherent risk due to safety reasons. In this context, there is also the intrinsic risk that the purchase/sale orders are not performed correctly or in due time. Therefore, it is mandatory that investors rely on the performance of the home broker system, so as to enable them to use it when necessary (McKnight, Choudhury, & Kacmar, 2002). In fact, according to Roca et al. (2009), the success of systems for trading shares via e-brokerage depends heavily on the trust investors have in the performance of same.

### 2.5. User satisfaction

Wixom and Todd (2005) argue that there are two distinct theoretical strands adopted in research into the adoption of Information Technology. The first one, previously presented, involves the models of acceptance of technology, with emphasis on the TAM and its variants. Conversely, the second one, initiated by Bailey and Pearson (1983) and Ives, Olson, and Baroudi (1983) among others, applies user satisfaction with the information system to explain the adoption of same. Both theoretical strands have largely contributed to an increase in understanding the success/failure of information system use, although remaining distinct from each other (Wixom & Todd, 2005).

According to Wixom and Todd (2005), these two approaches if used jointly might better explain the Information Technology adoption phenomenon. In particular, Wixom and Todd (2005) highlight the fact that unlike the TAM model and its variants, the literature on user satisfaction is markedly focused on the intrinsic characteristics of the system in use, overcoming what is considered a recurrent problem in Information Systems research, as supported by Orlikowski and Iacono (2001).

Mather, Caputi, and Jayasurya (2002) argue that the use of the intention of use dependent variable, as is done in TAM and its variants, can produce skewed results, as the respondents can present cognitive bias in their answers about their actual intention to use the system, trying to report just positive outcomes or say just what they believe they should say. Furthermore, the original dependent variable of TAM is useless in environments where use of the system is mandatory (Rawstorne, Jayasuriya, & Caputi, 2000). Lastly, the dependent variable used in TAM continues to be challenged, as some authors perceive it as intention of use of the system (Agarwal & Prasad, 1998), whereas others see it as the actual use of the system (Igarria et al., 1995).

Thus, due to its potential to mitigate the aforementioned problems, user satisfaction with the system can be an adequate and better antecedent for intention of use of the system, or even a proxy for user attitude related to use of the system, as supported by Mather et al. (2002). Therefore, it was decided to adopt user satisfaction with the home broker system in this work as a proxy for user attitude in relation to the use of same.

### 3. Proposed model and research hypotheses

While web-based home broker systems share some characteristics with online banking systems, they cannot be considered equal technologies (Roca et al., 2009). Thus, the intention in this study is to develop a model that integrates the main elements of the TAM and IDT with the trust and subjective norm constructs, the latter derived from the Theory of Reasoned Action (TRA) and the Theory of Planned Behavior (TPB). It is expected that the integration of theories that have been mutually set apart can increase the explanatory power of the proposed model in explaining user satisfaction with the IS and consequently the intention of use.

Furthermore, it is important to stress that the combination of the TAM with the trust construct in some models, as done by Wu and Chen (2005) among others, has been considered an improvement to better explain the rate of adoption of online systems. Moreover, according to Rogers (2003), as long as Internet-based financial services can be perceived as technological innovation, its diffusion is subject to influences forecast by the Innovation Diffusion Theory (IDT).

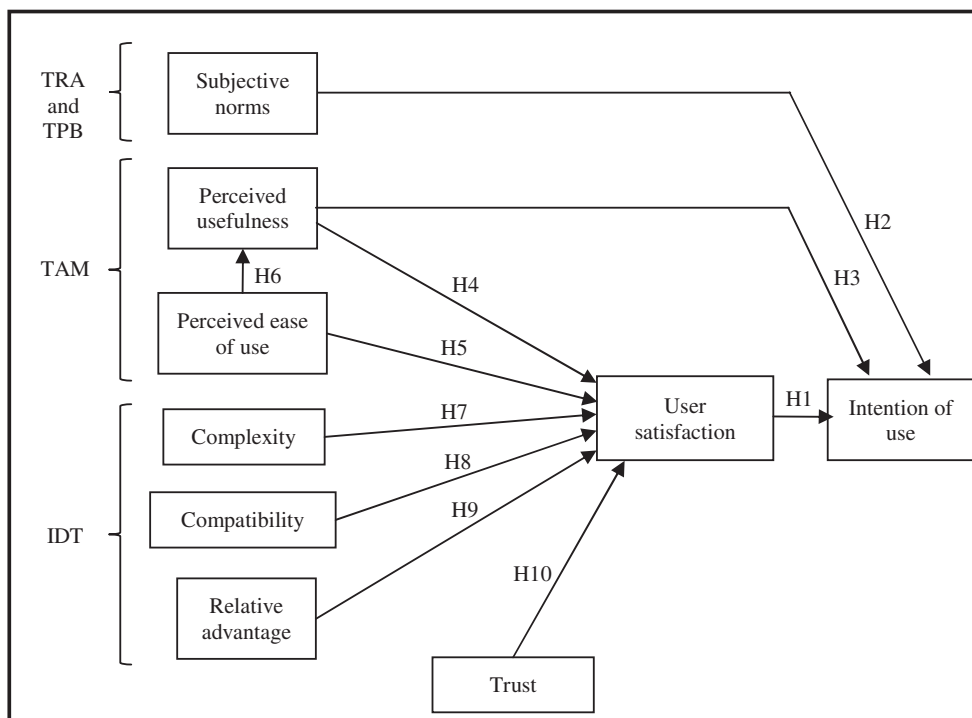
A research model is then developed from the abovementioned theoretical references and is depicted in Fig. 4. Subsequently, the research hypotheses accrued from this model are listed and discussed.

**H1.** User satisfaction has a positive effect on the intention of use of the home broker system.

**H2.** Subjective norms have a positive effect on the intention of use of the home broker system.

**H3.** Perceived usefulness has a positive effect on the intention of use of the home broker system.

**H4.** Perceived usefulness has a positive effect on user satisfaction with the home broker system.



**Fig. 4.** Research model.

Source: Authors based on the theoretical references

- H5. Perceived ease of use has a positive effect on user satisfaction with the home broker system.
- H6. Perceived ease of use has a positive effect on perceived usefulness of the home broker system.
- H7. Complexity has a negative effect on user satisfaction with the home broker system.
- H8. Compatibility has a positive effect on user satisfaction with the home broker system.
- H9. Relative advantage has a positive effect on user satisfaction with the home broker system.
- H10. Trust has a positive effect on user satisfaction with the home broker system.

Hypotheses 1, 3, 4, 5 and 6 were accrued from the TAM. They encompass the perceived usefulness and ease of use constructs, present in most of the models regarding acceptance of Information Technology (Lee et al., 2003; Legris et al., 2003) and variable user satisfaction as a proxy for variable user attitude in relation to use of the system (Wixom & Todd, 2005).

Hypothesis 2 is based on the TRA and TPB models, the combination of which with the TAM is found in several articles about IS acceptance (Lee, 2009). In these cases, the subjective norm construct is seen as an antecedent to system use intention (Taylor and Todd, 1995).

Hypotheses 7, 8 and 9 are supported by the IDT. As already stated, many authors suggest the combination of IDT with TAM (e.g. Benbasat & Barki, 2007), in order to add more explanatory power to the original model.

Hypothesis 10 refers to the trust construct, which has been extensively combined with classic models of technology adoption, mainly for web-based systems and operations related to purchase and sale of services and goods, as in the case of online investment (Carter & Belanger, 2005; Roca et al., 2009).

**4. Methodological procedures**

*4.1. Operationalization of constructs*

The constructs of the structural model were measured via scales previously tested and available in the extant literature. The constructs that compound the TAM and IDT, as well as subjective norms and trust, have been broadly studied and evaluated

Construct	Definition	Source	References of Use
Subjective norms	Perception of individuals that persons who are important to them believe they must use the information system.	Taylor and Todd (1995)	Wu and Chen (2005); Lee (2009)
Utility	The extent to which persons believe that by using an information system their performance at work will be improved	Davis et al. (1989)	Lee (2009); Roca et al. (2009)
Perceived ease of use	The extent to which persons believe that the use of an information system is effortless.	Davis et al. (1989)	Lee (2009); Roca et al. (2009)
Complexity	The extent to which an innovation is perceived to be to some extent difficult to be understood and used.	Rogers (2003)	Chen, Gillenson and Sherrell (2004); Carter and Belanger (2005)
Compatibility	The extent to which an innovation is perceived as consistent with users' past experiences and potential users' needs.	Rogers (2003)	Chen et al. (2004); Carter and Belanger (2005)
Relative Advantage	The extent to which an innovation is perceived as better than the preceding idea.	Rogers (2003)	Chen et al. (2004); Carter and Belanger (2005)
Trust	The belief that the other's promise will be fulfilled even in unforeseen conditions, encompassing three dimensions: ability, goodwill, and integrity.	Mayer et al. (1995)	Wu and Chen (2005); Roca et al. (2009)
Intention of use	Behavioral intention of individuals to use an information system.	Davis et al. (1989)	Wu and Chen (2005); Lee (2009); Roca et al. (2009)

**Fig. 5.** Definition of scales.  
Source: Authors



for a long time. There is therefore significant consensus on how they must be measured. Fig. 5 depicts these constructs, their definitions, sources of reference, and some articles wherein the scales were applied.

Unlike what happens to the constructs quoted above, there is still a certain disagreement on how to measure user satisfaction with an information system. According to Wixom and Todd (2005) and Ajzen and Fishbein (1980), user satisfaction can be understood as an attitude towards an object – in this case, an information system. Doll and Torkzadeh (1998) have thus developed a specific scale to measure user satisfaction with IS. However, Chin and Lee (2000) have later challenged it, as they support the fact that satisfaction accrues from the difference between the system's actual performance and expected performance. As there is to date no consensus on how to measure user satisfaction, it was decided to assess user satisfaction with the home broker system in this research via a scale varying from zero to ten, where the latter means the user is totally satisfied with the system, whereas the former signifies total dissatisfaction of the user with the system, as adopted by Albuquerque, Sousa, and Martins (2010).

#### 4.2. Sample and data collection

The sample of respondents in this research was obtained from the database of one of the major brokerage houses in Brazil. The database comprised 1545 investors who had made stock transactions, either via the traditional process or via the web between 2011 and 2014. Shortly before the data were collected, the brokerage house presented its home broker system to all of its stock market investors, giving them the opportunity to migrate to this new platform.

Data were collected via an electronic survey developed according to the aforementioned scales. The questionnaire had two parts. In the first part, demographic data of the respondents were collected, namely age, income, gender, educational level, and marital status. In addition to this, the participants were asked whether they were already users of home broker systems. The second part comprised the scales of the structural model proposed. All constructs, except for user satisfaction with the home broker system, were measured via a five-point Likert scale varying from 1 (totally disagree) to 5 (totally agree). As already mentioned, the scale used to measure user satisfaction varied from zero to ten.

Before the questionnaire was made available to all investors registered in the brokerage house database, a pre-test was undertaken with ten investors randomly selected among the users of the home broker system of the company. These participants were encouraged to criticize the questionnaire format, as well as to single out questions they consider to be vague or hard to understand. Their comments were used to refine the data collection instrument, there being no need to implement radical modifications in the original questionnaire.

The investors registered in the brokerage house were then invited via e-mails sent by the brokerage house to take part in the survey. In the message sent, the objectives of the survey were presented, stating clearly that investor participation was voluntary and the answers would be kept confidential. The e-mail also included a link to access the electronic survey.

The questionnaire was made available on the web from June to July 2014. By the end of this period, 152 questionnaires – corresponding to a response rate of 9.8% – were fully filled out, therefore being considered valid for the purposes of the research.

Most of the respondents were male (90.8% of the total sample), thereby duly reflecting the reality of the Brazilian stock market, in which female participation is still very low. About 80% of the participants informed that they had already used the home broker system of the brokerage house. More than half of the respondents were married (57.2%) and just over one third were single. The investors were evenly distributed between the seven income brackets defined in the questionnaire, with 59.2% reporting an income of more than US\$ 2500.00 per month. The respondents' age ranged from 22 to 66 years, with an average age of 34.8 years and a standard deviation of 9.2 years. Besides this, 98% of the respondents had a university degree, with 63.8% of them having a post-graduate degree.

#### 4.3. Method of analysis

The collected data were analyzed by using variance analysis based on the Partial Least Squares (PLS) technique. The PLS technique has been seen as an interesting alternative to traditional structural equation approaches based on covariance analysis, hereinafter called SEM, implemented via software such as LISREL, AMOS and R.

Among the advantages of the PLS method, the following can be singled out: (1) its robustness against violations associated with the multivariate normality premises required by SEM, multicollinearity among manifest variables, and problems concerning the specification of the structural equation model; (2) the possibility of addressing smaller samples than those required by SEM; (3) the ease of dealing with moderator variables; and (4) the possibility of modeling reflexive and formative constructs in an easier way (Chin, 2010). On the other hand, there are not yet any goodness of fit indexes in the PLS, like those already set up for SEM (e.g. GFI, AGFI, RMSEA), as well as statistical tests to compare alternative models. In this respect, the quality of a model using the PLS technique is usually assessed by means of its predictive capacity, as supported by the  $R^2$  values generated by the endogenous latent variables (Urbach & Ahlemann, 2010).

Since some studies have indicated that demographical factors might influence the intention to adopt information systems (e.g. Venkatesh & Bala, 2008), the following control variables were included in the proposed model: gender, age, educational level, and income. For the same reason, a dummy variable was also included indicating whether or not the respondent had already used the home broker system. These five control variables were linked to the most endogenous latent variable of the model, namely the intention of use.

The evaluation of the statistical significance of the effects estimated in a PLS model is done via resampling techniques, such as bootstrapping and blindfolding (Chin, 2010). In this study, the evaluation was performed via bootstrapping, with the size of samples being defined as 152 and the number of resamples being 1000. SmartPLS v. 2.0.M3 software was used for this evaluation.

## 5. Data analysis

The measurement model was assessed via confirmatory factor analysis (CFA), following the steps proposed by Wetzels, Odekerken-Schröder, and van Oppen (2009). From the results obtained, it was verified whether the conditions specified by Chin (2010) to assess the internal consistency and the convergent and discriminant validities of the model were achieved, namely: (1) the loads of the measurable variables must be high and significant; (2) the range of variation of these loads for the same latent variable must be small; (3) any cross-loads of observable variables must be smaller than the loads on their corresponding latent variables; (4) the average variances extracted (AVE) must be greater than 0.50; (5) the composite reliabilities must be equal to or greater than 0.70; and (6) the AVE square root for a latent variable must be greater than the latter correlation with the other latent variables.

It was observed that to meet the aforementioned requirements fully, some items needed to be removed. Thus, a new CFA was performed proving the convergent and discriminant validities of the scales. The final results are depicted in Table 1.

After the suitability of the measurement model was duly supported, the structural model was assessed and the results are presented in Fig. 6. It can be seen that the explained variance proportions for the satisfaction ( $R^2 = 0.38$ ) and intention of use ( $R^2 = 0.42$ ) variables are considered adequate, suggesting that the proposed model has moderate predictive power. It is important to stress, however, that part of the variation in the intention of use of the home broker system is explained by the user control variable, which indicated whether the respondent had already used the system before responding to the survey. While the magnitude of the effect of this variable is considerably lower than user satisfaction, this result suggests that investors who have already used the system are prone to continue using it in the future. None of the other demographic factors included as control variables in the model have a statistically significant effect on the intention of use of investors ( $\alpha = 0.05$ ).

Four hypotheses proposed in this work were supported empirically. As proposed in H1, investor satisfaction with the home broker system appears to be a strong predictor of intention of use of same in the future ( $\beta = 0.40$ ;  $p < 0.001$ ). This satisfaction, in turn, is influenced by perception of usefulness by investors ( $\beta = 0.22$ ;  $p < 0.05$ ) and ease of use perception ( $\beta = 0.14$ ;  $p < 0.05$ ), as well as system compatibility with their experiences, values, and needs ( $\beta = 0.33$ ;  $p < 0.05$ ). Thus, these findings support hypotheses H4, H5 and H8.

## 6. Discussion

The results obtained suggest that, as forecast by the TAM, home broker system usefulness as perceived by the investors has a positive influence on their satisfaction with the system. The perceived usefulness construct is very well known and used in the academic literature and is often found in studies supported by TAM as an antecedent of the attitude and intention of use of an information system. This finding is compatible with Roca et al. (2009), who verified that perceived usefulness is an antecedent of adoption of online trading systems.

Likewise, the perceived ease of use seems to have a positive influence on investor satisfaction with the home broker system. However, this influence is considerably lower than the influences accrued from the other significant antecedents. This might be associated with the fact that the web interface for online trading systems tends to be user-friendly (Roca et al., 2009). Moreover, when studying online trading systems, Cheng, Lam, and Yeung (2006) realized that users are more concerned with the performance of the stock trading process than with the potential difficulties of learning how to use the online trading system. Moreover, it is important to stress that Venkatesh et al. (2003) argue that the perceived ease of use tends to be more relevant during the first stages of learning how to use an information system, becoming less important throughout the period of use (Venkatesh et al., 2003). In the sample collected, approximately 80% of respondents had already used the home broker system of the

**Table 1**  
Assessment of the measurement model.  
Source: Authors

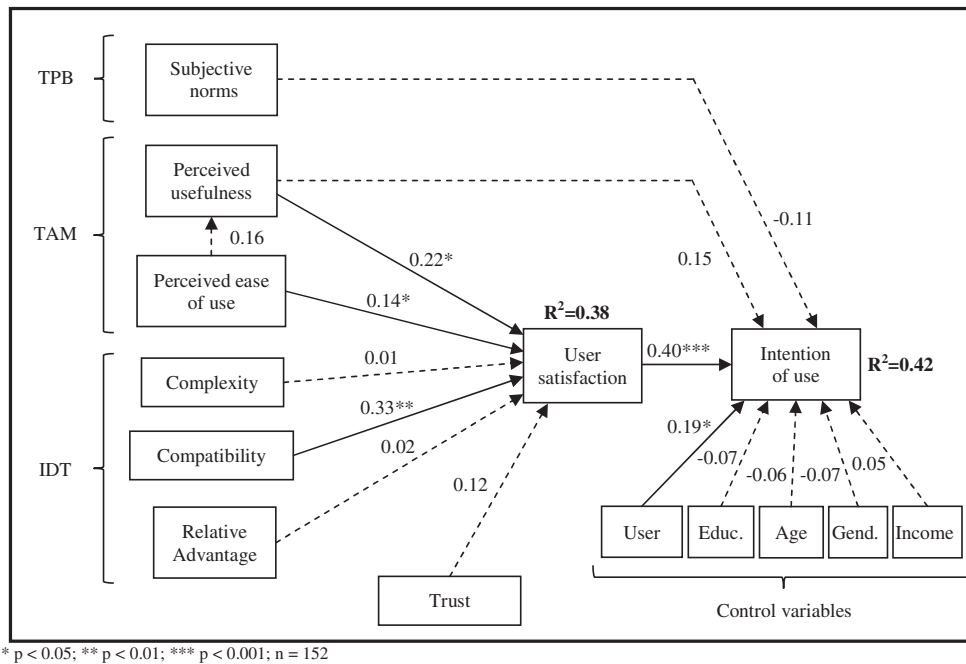
Latent variables	Items	Loads	Average <sup>a</sup>	St.Dev. <sup>a</sup>	CR	AVE	$\alpha_c$	Maximum correlation <sup>b</sup>
Subjective norms	3	0.76–0.91	1.92	0.93	0.89	0.72	0.81	0.33
Perceived usefulness	3	0.81–0.87	4.49	0.64	0.88	0.71	0.79	0.55
Perceived ease of use	2	0.86–0.92	4.04	0.86	0.89	0.80	0.75	0.58
Complexity	2	0.93–0.94	3.95	0.85	0.93	0.87	0.85	0.58
Compatibility	3	0.81–0.92	3.98	0.71	0.89	0.72	0.80	0.60
Relative advantage	3	0.77–0.86	3.82	0.71	0.87	0.68	0.77	0.60
Trust	2	0.79–0.88	3.69	0.66	0.82	0.70	0.57	0.67
Satisfaction <sup>c</sup>	1	1.00	6.94	2.30	–	–	–	0.58
Intention of use <sup>c</sup>	1	1.00	4.58	1.23	–	–	–	0.58

<sup>a</sup> Average and standard deviation were calculated on the basis of the scores generated by PLS for the latent variables.

<sup>b</sup> Maximum correlation (in absolute value) with the other latent variables.

<sup>c</sup> CR, AVE and  $\alpha_c$  were not calculated for scales with only one item.





**Fig. 6.** Results from the structural model.  
Source: Authors

brokerage house under analysis. Thus, they probably have reasonable experience with this system, thereby reducing the importance of perceived ease of use as an antecedent to the intention of use of the home broker system.

The analysis conducted also supported hypothesis H8, namely that compatibility influences investor satisfaction with the home broker system in a positive way. This finding is corroborated by Carter and Belanger (2005), who found compatibility to be the most important factor in favor of the adoption of e-government systems.

Thus, stock trading in the virtual arena must be compatible with the existing manual process already used by investors in the real arena, whose modus operandi they are acquainted with.

There are, however, factors without statistical significance in the model tested that deserve further analysis. Thus, the hypotheses that are not supported by the empirical data (i.e., p-level > 0.05) must now be discussed.

The rejection of hypothesis H3, regarding the influence of subjective norms on intention to use the system, is also supported in other studies (Wu & Chen, 2005). Venkatesh and Davis (2000) argue that subjective norms can be a highly significant factor in settings where use of the system is mandatory, which is not the case in the research under analysis. Furthermore, home broker systems are still in their initial diffusion stage, there being little or no pressure of the adopters over the potential users, such as relatives, friends, and co-workers, to use the system (Wu & Chen, 2005). Therefore, it is reasonable to assume that the effect of subjective norms on the intention to use the home broker system is not statistically significant.

The explanation above regarding the insignificant effect of perceived ease of use on user satisfaction can also be extended to the results accrued from the complexity construct. According to the results, hypothesis H7, namely that complexity of the home broker system has a negative effect on user satisfaction, must be rejected. As already mentioned, the main concern of investors is that their purchase/sale orders are implemented in a timely and accurate manner, rather than being concerned about a simple/complex system. On the other hand, Carter and Belanger (2005) suggest that complexity has the same effect as perceived ease of use, thereby eliminating the complexity factor from their model on the adoption of e-government systems. However, the CFA assessment supported the convergent and discriminant validities of both constructs. Thus, it is possible that this issue is related to substantial differences in the interpretation by the respondents of the items of these two scales. New studies must therefore be conducted to check if the translation of the scale items from English to Brazilian Portuguese might have influenced the respondents' answers.

Hypothesis H9, which links the relative advantage to user satisfaction was not supported either. The relative advantage construct is defined as the degree to which an innovation is perceived as being better than the idea that precedes it (Rogers, 2003). Most of the respondents, due to their educational level and purchasing power, are users of the Internet and the web. Thus, as they must consider the digital media compatible with their lifestyles, it is possible that investors do not consider web-based stock trading as a new benefit, as they use similar technologies to interact with their friends and colleagues, to conduct business, etc. Hence, the home broker systems merely meet an existing expectation (Carter & Belanger, 2005).

Finally, when analyzing online trading systems, Roca et al. (2009) stress the importance of trust for acceptance of the home broker systems. Likewise, Wu and Chen (2005) point out that the introduction of the trust factor in the TAM and TPB models

can increase their capacity of explaining the adoption of IS systems. However, the results accrued from the final structural model do not support the trust construct as a significant antecedent of user satisfaction with the home broker system (H10). This might be explained by the fact that most of the respondents have been customers of the brokerage house under analysis for a long time. This is corroborated by the high averages and low standard deviations associated with the trust construct indicators. However, further studies are needed to ascertain this aspect in an in-depth manner.

## 7. Conclusions

From the standpoint of the stock market investors, this article sought to investigate the antecedents to the intention of use of home broker systems. Based on the findings, the conclusion reached is that compatibility and perceived usefulness and ease of use are significant antecedents of user satisfaction with the system, which in turn influences the user adoption intention in a positive way. It should be noted, as mentioned above, that satisfaction can be seen as a proxy for the attitude of use of information systems (Konana & Balasubramanian, 2005).

### 7.1. Academic implications

This study sought to investigate the antecedents to the adoption of a specific technology – in this case, home broker systems – by means of developing and testing an original structural model generated from the extant scientific literature, in line with the recommendations of Orlikowski and Iacono (2001) and Benbasat and Barki (2007), who support that specific technologies demand the adoption of specific rather than general technology models. Moreover, the study aimed at integrating two theoretical strands that have followed different paths, namely technology adoption and user satisfaction (Mather et al., 2002; Wixom & Todd, 2005).

The importance of user satisfaction with the home broker system as a proxy for the user attitude towards this system can be considered an academic contribution of this work, as these two approaches are rarely used together (see Mather et al., 2002). The findings reveal that the joint use of these two theoretical approaches can be more adequate than the use of either of them on their own. Therefore, this study highlights the possibility and need to develop and test variants of the model herein presented, taking into account not just the ubiquitous “TAM xx” models (Benbasat & Barki, 2007), but also other approaches such as IDT and trust (Carter & Belanger, 2005) and, mainly, the user satisfaction construct with the technology under analysis.

Lastly, as already mentioned, this article addresses an under-researched area – online investing – which is different from Internet banking due to the array of reasons already given (Roca et al., 2009). Thus, mimicking the models developed to explain Internet banking adoption, as if they were able to fully explain the stock trading process on the web was avoided in this work (Konana & Balasubramanian, 2005).

### 7.2. Managerial implications

This work revealed compatibility and perceived usefulness and ease of use as antecedents to user satisfaction with home broker systems, with user satisfaction being a strong antecedent of system use.

Regarding compatibility, it might be argued that home broker systems that are congruent with the way stock market investors interact with other systems in the web, being that social interaction (social media, e-mails, etc.), economic interaction (purchase of products and services via the Web) or professional interaction (activities related to daily work), have a greater chance of satisfying users and being accepted and used by them.

Compatibility is the most significant antecedent to user satisfaction with home broker systems. This is no surprise, as this construct has often been found as a highly relevant antecedent to attitude/intention of use of systems in sundry contexts, mainly e-commerce systems (Van Slyke, Bélanger, & Comunale, 2004). Thus, in order to increase user satisfaction with home broker systems, brokerage houses must provide information and services in a manner consistent with other ways investors have to interact with these brokerage houses. For instance, online forms must be similar to paper forms the stock investors are acquainted with, the same being true for the modus operandi of traditional stock trading. Likewise, compatibility can also be achieved if financial market companies decide to standardize their website interfaces. While this may not be feasible in the short term, an increase in demand by investors for home broker systems can eventually lead to such standardization. Thus, standardizing the interface and interaction of users with brokerage houses and bank websites will increase compatibility and, consequently, user satisfaction and intention of use as investors move from one website to another (Carter & Belanger, 2005).

Likewise, the home broker system usefulness and ease of use perceptions are important antecedents to user satisfaction with same. This can also be explained by the specificities of the stock trading process, extremely dependent upon the system's responsiveness to the investors' purchase/sale orders (Konana & Balasubramanian, 2005). Therefore, home broker systems that deal with investors' orders in a fast, simple and precise way increase user satisfaction with same, conveying to an increase in intention of use of the system by investors (Roca et al., 2009).

As user satisfaction is an important construct for the development of the system in question (Wixom & Todd, 2005), these observations should be taken into consideration by organizations when designing and developing their home broker systems.

### 7.3. Research limitations and further steps

Some limitations must be mentioned when assessing this research.

One limitation refers to the technology adoption models (TAM, TRA, TPB, and IDT) addressed in the theoretical references of this work. They do not completely exhaust the totality of the models available in the extant scientific literature, being chosen in a discretionary manner by the authors. Thus, there might be other variables that deserve to be considered that were not taken into account in this study.

Besides, the user satisfaction construct was measured via a scale ranging from zero to ten, leaving room for respondents' biases when answering the survey. In other words, another elaborated scale was not applied in the measurement of this construct, such as the one developed by Doll and Torkzadeh (1998), who address the construct in a multi-dimensional way. It is, however, important to stress that the option of not using this scale accrues from the fact that it has been challenged by Chin and Lee (2000), as explained above in this article.

Lastly, one can set forth some suggestions for further research in this knowledge field, as explained below.

The research was conducted with investors who are users or potential users of home broker systems. An experiment might be conducted with investors who invest in the stock market but have opted for not using home broker systems, attempting to ascertain the reasons for this rejection.

Furthermore, the web survey comprises a reduced number of respondents. Thus, further research might be conducted with a larger number of respondents, so as to compare the results with those accrued from this study. Besides, other methodological procedures based on qualitative analysis might also be used in order to compare the results.

Lastly, this article addresses an insufficiently researched area in Brazil, which may mean that in the near future more research corroborates or challenges the results set forth here in order to foster academic and managerial knowledge about the adoption of home broker systems.

## References

- Agarwal, R., & Prasad, J. A. (1998). Conceptual and operational definition of personal innovativeness in the domain of information technology. *Information Systems Research*, 9(2), 204–215.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211.
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewoods Cliff, N.J.: Prentice-Hall.
- Albuquerque, F. J. B., Sousa, F. M., & Martins, C. R. (2010). Validação das escalas de satisfação com a vida e afetos para idosos rurais. *Psico*, 41(1), 85–92.
- Bailey, J. E., & Pearson, W. (1983). Development of a tool for measuring and analyzing computer user satisfaction. *Management Science*, 29(5), 530–545.
- Balasubramanian, S., Konana, P., & Menon, N. W. (2003). Customer satisfaction in virtual environments: A study of online investing. *Management Science*, 49(7), 871–889.
- Benbasat, I., & Barki, H. (2007). *Quo Vadis TAM?* *Journal of the Association for Information Systems*, 8(4), 211–218 (Article 3).
- Carter, L., & Belanger, F. (2005). The utilization of e-government services: Citizen trust, innovation and acceptance factors. *Information Systems Journal*, 15(1), 5–25.
- Chen, L. -D., Gillenson, M. L., & Sherrell, D. L. (2004). Consumer acceptance of virtual stores: A theoretical model and critical success factors for virtual stores. *SIGMIS Database*, 35(2), 8–31.
- Cheng, T. C. E., Lam, D. Y. C., & Yeung, A. C. L. (2006). Adoption of internet banking: An empirical study in Hong Kong. *Decision Support Systems*, 42(3), 1558–1572.
- Chin, W. W. (2010). How to write up and report PLS analyses. In V. E. Vinzi, W. W. Chin, J. Henseler, & H. Wang (Eds.), *Handbook of partial least squares: Concepts, methods and applications* (pp. 655–690). Heidelberg: Springer-Verlag.
- Chin, W. W., & Lee, M. K. (2000). A proposed model and measurement instrument for the formation of IS satisfaction: The case of end user computer satisfaction. *Proceedings of the twenty first International Conference of Information Systems* (pp. 553–563).
- Cho, V., & Cheung, I. (2003). *A study of on-line legal service adoption in Hong Kong*. Department of Management, The Hong Kong Polytechnic University.
- Costa, A., & Joia, L. A. (2006). Critical success factors for e-brokerage: An exploratory study in the Brazilian market. In S. Kamel (Ed.), *Electronic business in developing countries: Challenges and opportunities* (pp. 193–213). Hershey, PA: Idea Group Publishing.
- Costa-Filho, B. A., & Pires, P. J. (2005). Avaliação dos Fatores Relacionados na Formação do Índice de Prontidão à Tecnologia - TRI (Technology Readiness Index) como Antecedentes do Modelo TAM (Technology Acceptance Model). *Proceedings of the Encontro Anual da Associação Nacional de Programas de Pós-Graduação em Administração (EnANPAD)*, Brasília, 2005.
- Dasgupta, S., & Dickinson, F. (1998). Electronic contracting in online stock trading. *Electronic Markets*, 8(3), 20–22.
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35(8), 982–1003.
- Doll, W. J., & Torkzadeh, G. (1998). Developing a multidimensional measure of system-use in an organisational context. *Information and Management*, 33(4), 171–185.
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Boston, MA: Addison-Wesley.
- Gutman, L. F., & Joia, L. A. (2012). Antecedentes da Percepção de Qualidade de Sistemas Home Broker na Ótica de seus Usuários. *Proceedings of the Encontro Anual da Associação Nacional de Programas de Pós-Graduação em Administração (EnANPAD)*, Rio de Janeiro.
- Igarbía, M., Guimarães, T., & Davis, G. B. (1995). Testing the determinants of microcomputer usage via a structural equation model. *Journal of Management Information Systems*, 1(4), 87–114.
- Ives, B., Olson, M. H., & Baroudi, J. J. (1983). The measurement of user information satisfaction. *Communications of the ACM*, 26(10), 785–793.
- Kim, H. -W., & Kankanhalli, A. (2009). Investigating user resistance to information systems implementation: A status quo bias perspective. *MIS Quarterly*, 33(3), 567–582.
- Konana, P., & Balasubramanian, S. (2005). The social-economic-psychological model of technology adoption and usage: An application to online investing. *Decision Support Systems*, 39(3), 505–524.
- Lee, M. C. (2009). Factors influencing the adoption of internet banking: An integration of TAM and TPB with perceived risk and benefit. *Electronic Commerce Research and Applications*, 8(3), 130–141.
- Lee, Y., Kozar, K. A., & Larsen, K. R. T. (2003). The technology acceptance model: Past, present, and the future. *Communications of the AIS*, 12(0), 752–780.
- Legris, P., Ingham, J., & Colletette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management*, 40(3), 191–204.
- Mather, D., Caputi, P., & Jayasurya, R. (2002). Is the technology acceptance model a valid model of user satisfaction of information technology in environments where usage is mandatory? In A. Wenn, M. McGrath, & F. Burstein (Eds.), *Enabling organisations and society through information systems: Proceedings of the thirteenth Australasian Conference on Information Systems* (pp. 1241–1250).
- Mayer, R., Davis, J., & Shoorman, F. (1995). An integrative model of organizational trust. *Academy of Management Review*, 20(3), 709–734.

- McKnight, H., Choudhury, V., & Kacmar, C. (2002). Developing and validating trust measures for e-commerce: An integrative typology. *Information Systems Research*, 13(3), 334–359.
- Orlikowski, W., & Iacono, C. S. (2001). Research commentary: Desperately seeking the 'IT' in IT artifact. *Information Systems Research*, 12(2), 121–134.
- Rawstorne, P., Jayasuriya, R., & Caputi, P. (2000). Issues in predicting and explaining usage behaviours with the technology acceptance models and theory of planned behaviour when usage is mandatory. In W. Orlikowski, P. Weill, S. Ang, H. C. Kromar, & J. I. DeGross (Eds.), *Proceedings of the twenty first International Conference of Information Systems, Brisbane* (pp. 37–46) (2000).
- Roca, J. C., Garcia, J. J., & De La Vega, J. J. (2009). The importance of perceived trust, security and privacy in online trading systems. *Information Management & Computer Security*, 17(2), 96–113.
- Rogers, E. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.
- Rousseau, D. M., Sitkin, S. B., Burt, R. S., & Camerer, C. (1998). Not so different after all: A cross-discipline view of trust. *Academy of Management Review*, 23(3), 393–404.
- Schlosser, A. E., White, T. B., & Lloyd, S. M. (2006). Converting web site visitors into buyers: How web site investment increases consumer trusting beliefs and online purchase intentions. *Journal of Marketing*, 70(2), 133–148.
- Sharma, M., & Bingi, P. (2000). The growth of web-based investment. *Information Systems Management*, 17(2), 58–64.
- Taylor, S., & Todd, P. A. (1995). Understanding information technology usage: A test of competing models. *Information Systems Research*, 6(2), 144–176.
- Urbach, N., & Ahlemann, F. (2010). Structural equation modeling in information systems research using partial least squares. *Journal of Information Technology Theory and Application*, 11(2), 5–40.
- Van Slyke, C., Bélanger, F., & Comunale, C. (2004). Factors influencing the adoption of web-based shopping: The impact of trust. *The Data Base for Advances in Information Systems*, 35(2), 32–49.
- Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research*, 11(4), 342–365.
- Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, 39(2), 273–315.
- Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186–204.
- Venkatesh, V., Davis, F. D., & Morris, M. G. (2007). Dead or alive? The development, trajectory and future of technology adoption research. *Journal of the Association for Information Systems*, 8(4), 268–286.
- Venkatesh, V., Morris, M., Davis, G., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478.
- Venkatesh, V., Thong, J. Y. L., & Xin, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, 36(1), 157–178.
- Voss, C. (2000). Developing an eService strategy. *Business Strategy Review*, 11(1), 21–33.
- Wetzels, M., Odekerken-Schröder, G., & van Oppen, C. (2009). Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. *MIS Quarterly*, 33(1), 177–195.
- Wixom, B. H., & Todd, P. A. (2005). A theoretical integration of user satisfaction and technology acceptance. *Information Systems Research*, 16(1), 85–102.
- Wu, I. L., & Chen, J. L. (2005). An extension of trust and TAM model with TPB in the initial adoption of on-line tax: An empirical study. *International Journal of Human-Computer Studies*, 62(6), 784–808.