The Social–Economic–Psychological model of technology adoption and usage: an application to online investing

Prabhudev Konanaa,*, Sridhar Balasubramanianb,1

a Department of MSIS B6500, McCombs School of Business, University of Texas at Austin, Austin, TX 78712, USA
b Department of Marketing CB# 3490, The Kenan-Flagler Business School, University of North Carolina at Chapel Hill, Chapel Hill, NC 27599-3490, USA

Received 1 January 2003; accepted 1 December 2003
Available online 21 March 2004

Abstract

We champion the view that a richer understanding of electronic markets is obtained when their implications for consumers are jointly studied from social, economic, and psychological perspectives. We adopt this perspective triad to build a Social–Economic–Psychological (SEP) Model of technology adoption and usage, and apply the model to understand and explain the behavior of online investors. The SEP model provides a foundation for a multidisciplinary approach to the study of electronic markets and online consumers in the fields of MIS, marketing, and finance.

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Keywords: Electronic markets; Technology adoption; Diffusion of innovation; Social–Economic–Psychological model

1. Introduction

Consider the following comments from some of the investors we interviewed for this study: 2

1. “I set up the online account with my personal savings for speculative “in and out” purchases. I use my full service broker for my core holdings.”
2. “I enjoy conducting my own research and making my own (trading) choices. I have spoken with many brokers and find that they may be no better informed than I am. All the information I received from a traditional broker was available on the WWW. In some respects (online investing) is a game of educated chance. I enjoy that. I do rely on a combination of brokers and planners for long-term retirement vehicles.”
3. “Investing (on my own) is satisfying and exciting.”
4. “I was burned many times by bad advice (from human brokers). The new HOT stock tip normally fizzled out way before I bought the stock! I figured if I’d lose anyway, it had better be on account of my own decisions and not those of some broker. When broker advice resulted in losses, it was both costly and painful.”
5. “I felt left out when my friends discussed the performance of their stocks and their recent trades

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* Authors are listed in reverse alphabetical order. Both authors contributed equally to this paper.
* Corresponding author. Tel.: +1+512-471-5219.
E-mail addresses: pkonana@mail.utexas.edu (P. Konana), balasubs@bschool.unc.edu (S. Balasubramanian).
1 Tel.: +1-919-962-3194.
2 These statements have been edited for grammar and flow.
at parties. I got into online investing so that I would not miss out on the action, both financially and socially.”

These comments illustrate some attitudes, beliefs, and behaviors of online investors. Comments 1 and 2 above suggest that investors physically and mentally allocate their assets that are traded online and in more conventional ways into separate accounts (e.g., [74,76]). Further, they evaluate and manage those accounts with differing objectives. Comments 2 and 3 illustrate that the utility derived from online investing includes important sources of non-monetary utility (e.g., utility related to increased control, and hedonic utility related to the gambling experience). Comments 2 and 4 also suggest that the act of trading online may invoke multiple biases that influence both the decision to trade and the evaluation of the outcomes to such trades. For example, online investors may be more likely to attribute success to their own selves and assign blame for losses to the brokers or the market (e.g., [29,39,72]), and may suffer from illusions of knowledge and control (e.g., [8,52]). Finally, comment 5 suggests that the decision to trade online may be driven by powerful social motivations.

Taken together, these comments suggest that to achieve a comprehensive understanding of online investing, and more generally, of other technology-intensive domains where consumers of a product or service adopt an active role, a multifaceted view of the domain that jointly accommodates social, economic, and psychological perspectives is called for. The model developed in this paper contributes to the literatures in marketing, MIS, technology management and related areas by facilitating such a view of technology adoption and usage.

We define online investing as the set of activities undertaken by individual investors in connection with the independent management of their investing accounts with online brokers. These activities include the online collection of information about stocks and firms, the online monitoring of stock portfolios, and the online placement of trade orders. The rapid growth of such investing is widely attributed to the fact that it offers investors a combination of low costs, convenience, and control over on their investments. The widespread adoption of online investing is aptly summarized by the title—“A Nation of Traders”—of the cover story in the October, 1999 issue of Fortune magazine. Over 20 million households in the United States now trade online.

The notion of “do-it-yourself” investing is not new. Some discount brokers have employed dial-up arrangements to provide such services since the mid 1970s. The guiding principle was that investors who were capable of making their own investment decisions could be empowered to independently execute transactions at lower commission rates. An executive with an early venture into online trading pioneered by Internet service provider Prodigy in the late 1980s has described the operation as follows: “We’d tear the order off the printer and place the trade. If we did a dozen trades a day, we’d be on top of the world” (Fortune magazine, October 1999). Parallel with the growth of the Internet, “do-it-yourself” investing has rapidly grown in both volume and sophistication. The costs of trading online have also fallen sharply and many brokers now offer commission rates of less than US$10 per trade. Online trades now account for nearly 40% of all retail transactions. These developments have forced traditional full-service brokers to re-engineer their operations—many brokers have altered their commission structures and rates and now offer trading services across both conventional and online channels.

While the growth of online investing has been impressive, it has not been without controversy. First, the shift in control of the trading process from a conventional human intermediary (i.e., broker) should not be viewed merely as a transfer of responsibility for the placement of trade orders. Rather, this shift engenders many alterations in the nature of the decision processes related to trading, making room for multiple psychological biases that distort such decision-making [6]. These biases can affect investor beliefs and trading behavior, and the way they evaluate the economic returns from online investing.

Next, the efficiencies that investors associate with the virtual trading interface may be more perceived than real. For example, online investors who focus on the rapid feedback available from the trading interface may assume that their order has been processed quickly and at the best available rates. However, these investors have few means to objectively evaluate whether they received the best available prices. Compounding this situation, many online brokers may
route investor order through third-party market makers, receiving a kickback or “payment for order flow.” Investors may not be aware of such side payments. Hence, the process of online investing may impart an undeserved sense of security and satisfaction to investors [51].

Third, the socially embedded nature of online investing activity may impose pressures on online investors that are inconsistent with their own interests. Many investors who adopted online trading during the last few years did so due to social pressures. With news about stocks and trades permeating conversations around coffee-tables, water-coolers, and virtual communities, the need to “belong” in these conversations and catch up with the money making by colleagues and social peers were powerful motivators of the decision to adopt online trading. However, investing activity that is driven by social pressures tends to have an infectious effect, leading to a situation described in Ref. [79], p. xii–xiii as “(one) in which temporarily high prices are sustained largely by investors’ enthusiasm rather than by consistent estimation of real value.” Stated differently, socially driven enthusiasm for trading may substitute for rigorous economic reasoning in influencing the nature and frequency of trading decisions.

Some of the deleterious effects of online investing have been empirically demonstrated [8]. In this study, each member of a sample of 1607 investors who traded online at least once between January 1992 and December 1995, was matched with a corresponding investor who did not trade online, but had a close correspondence in terms of the market value of common stock positions. Using this matched-pair research design, it was revealed that: (a) investors switching to online trading experienced unusually strong performance prior to going online; (b) after going online, these investors traded more actively, more speculatively, and less profitably than before.

The analysis in Ref. [8] of the online investors’ behavioral patterns and the resulting economic outcomes provides an interesting, but partial account of the implications of online investing. That work, in the spirit of early research in behavioral psychology, provides a strong documentation of outcomes, but is less expansive on how and why those outcomes occur, and more generally, on the broader set of factors that drive investor utility in the context of online trading. In bridging the gap between these subjective factors and outcomes, our conceptual analysis complements the behavioristic approach in Ref. [8] by adopting, in parallel, perception-based and cognition-based perspectives to explore online investors’ attitudes, beliefs, and behaviors.3

Whereas online investing constitutes the specific domain for the study, many of the presented arguments are relevant more generally in domains where the responsibility for information search and transactions shifts from an experienced agent to the consumer. Such domains include, for example, online sites run by sellers, auctioneers, and travel service providers. Hopefully, therefore, our analysis provides a broad foundation for the study of the antecedents and implications of technology adoption and usage jointly from social, psychological, and economic perspectives. Of course, while the arguments advanced in this paper are applicable across multiple domains, not all arguments may be applicable or relevant to every domain, and inferences drawn in the context of online investing must be extended to other domains with due adjustments.

The paper is structured as follows. In Section 2, a brief theoretical background is provided. The methodology and model are described in Section 3. In Section 4, detailed hypotheses underlying the model are developed. In Section 5, the limitations of this paper are discussed and opportunities for future research are detailed.

2. Theoretical background

Multiple models have been advanced in previous research to explain the adoption and usage of technology by individuals. The Technology Adoption Model (TAM) [22] adapts the Theory of Reasoned Action (TRA) [31] to posit that perceived usefulness and perceived ease of use together determine an individual’s attitude towards adopting and using a certain technology—this attitude drives

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3 Researchers in behavioral finance have applied theories from psychology and other social sciences to explain certain anomalies in financial markets and financial decision-making [23,28,78]. In this paper, we focus more on individual investors than on issues related to aggregate market performance.
usage intentions, and such intentions, in turn, drive adoption and usage behavior. Unlike TRA, TAM also posits a direct link from perceived usefulness to intention, bypassing attitude. The reasoning is that, in work situations, the perceived job performance consequences of using (or not using) the system may drive intentions and behavior, regardless of the attitude towards adoption. Subsequent research has expanded TAM in multiple directions. For example, TAM2 examines the antecedents of perceived usefulness and incorporates the subjective norm (i.e., social pressures related to adoption) [86]. The impact of computer self-efficacy, objective usability, and experience with a system on perceived ease of use is examined in [88], whereas the antecedents of perceived ease of use in terms of anchors (i.e., general beliefs about computers and computer usage) and adjustments (beliefs shaped by direct experience with the target system) are examined in Ref. [87].

The Theory of Planned Behavior (TPB) [2] also extends TRA, but is particularly accommodative of conditions where potential users of technology control their behavior to a limited extent. In TPB, behavior is posited to be a function of behavioral intention and perceived behavioral control. Behavioral intention, in turn, is a function of beliefs related to attitude (representing one’s positive or negative feelings towards performing an action), the subjective norm (representing social and environmental pressures to perform an action), and perceived behavioral control (representing internal and external constraints on behavior, or, alternatively, the resources and opportunities that support the behavior—this variable also directly affects behavior).

To overcome some of the conceptual and measurement problems related to beliefs associated with attitude, the subjective norm, and behavioral control in TPB, the Decomposed Theory of Planned Behavior was proposed [82]. In this model, the multidimensional belief constructs are decomposed as follows: attitudinal beliefs into beliefs related to perceived usefulness, ease of use, and compatibility; subjective norm-related beliefs into those related to peer influences and superiors’ influences; and behavioral control beliefs into those related to self-efficacy, resource facilitating conditions, and technology facilitating conditions.

The models discussed above (and variants thereof) have been empirically verified under various conditions. Further, numerous studies have examined the drivers of product value at the level of product characteristics (e.g., [64]) and have addressed the antecedents and implications of technology adoption at an organizational level (recent ones include Refs. [9, 91]). While research into the antecedents and implications of technology adoption has steadily progressed, strong arguments have been advanced that researchers have not capitalized on the centrality of information technology in everyday life [61]. Based on a survey of articles related to IS, it has been argued that Information Technology artifacts are either absent, black-boxed, abstracted from social life, or reduced to surrogate measures. Specifically, the need to “pay special attention to the multiple social, psychological, economic, historical, and computational aspects of an evolving array of technologies (…) and for using interdisciplinary theories of IT artifacts (…)” has been highlighted ([61], p. 130). In concurring with this view, we adopt a multidisciplinary approach in our analysis. Further, existing approaches to IT adoption and usage have not paid attention to the “fun” aspect of technology—we explicitly address this issue by exploring how the adoption and usage of technology-intensive applications can yield hedonic gains. As we demonstrate, complex IT-driven phenomena such as online investing may involve a web of interdependencies related to constructs either purely of a social, economic, and psychological nature, or to constructs that lie at the interfaces between these areas. In some ways, our approach also represents a revival of, and a response to, the early call of researchers to expand on narrow views of what IT is, and what IT does [50, 55].

3. Conceptual model

3.1. Methodology

We collected data from three sources. First, we conducted detailed face-to-face interviews with 35 online investors to understand (a) why they adopted online investing, and (b) specific sources of satisfaction and dissatisfaction related to the online investing experience. Second, we conducted telephonic and
email discussions with managers at 40 online brokers to build institutional knowledge regarding online investing and to obtain a supply-side perspective of the investing marketplace. Third, we administered detailed surveys to online investors from a well-known online broker (name withheld for confidentiality) and the members of the American Association of Individual Investors (AAII). At the time the survey was administered, the online broker operated over 400,000 investor accounts and priced its services in the lowest quartile of the market. The AAII is a non-profit organization that provides investing-related information to over 170,000 members who invest through traditional and/or online brokers. All surveys were administered online, and over 700 responses were received. The survey included a mix of questions about investors’ motivations for online investing, their online investing experience, and their investment patterns across online and conventional brokerages.

Investors were also encouraged to provide free-form comments.

Based on our surveys, interviews with online investors, and existing research, we first demarcated a set of factors that influence the online investing experience. Next, we classified these factors within and across economic, social, and psychological areas—some factors overlapped across multiple areas. We then built a theoretical framework that established a web of relationships between these factors. The considered factors and the proposed relationships between them together constitute the SEP model (see Fig. 1).

3.2. Model

To develop the model, we worked backwards from investor satisfaction with the online investing experience and the online broker. We deem such satisfac-

![Fig. 1. Online investing as a Social–Economic–Psychological Phenomenon: the SEP model.](image-url)
tion, rather than purely economic returns, to be an appropriate “destination” for the online investor on the basis of field interviews, which suggested that, in parallel with the pursuit of economic returns, investors persisted with online investing because they enjoyed it as a process. Specifically, our field research suggested that satisfaction is driven by three key determinants.4

3.2.1. Determinant 1: Perceived utilitarian gains

Six factors are posited to influence utilitarian outcomes and their evaluation. Two of these factors relate to the operational characteristics of the online broker: (a) perceived operational competence, which captures the responsiveness of the trading system in fulfilling orders and providing corresponding feedback, and the ability of online brokers to provide sufficient, timely and accurate information related to stocks; and (b) convenience, which captures the investor’s ability to quickly collect information and trade from any computer terminal or mobile device at any time.

The pattern of trades, and the resulting economic outcomes, may also be influenced by investor over-confidence, which reflects an inflated estimation of his or her ability to beat the market. While it may be argued that an expert outside observer may, by and large, be able to objectively measure economic outcomes, such measurement from the perspective of the investor is colored by numerous perceptual biases and cognitive mechanisms that he or she may bring to bear on the evaluation. Two of the factors posited to influence utilitarian outcomes and their evaluation relate to such biases and cognitive mechanisms: (a) self-attribution, which describes a bias that relates positive outcomes to the investor’s own decisions, and negative outcomes to decisions by “others” or to the market; and (b) mental accounting, which results when investors mentally partition their wealth into distinct accounts and treat the resulting partitions differently. Finally, utilitarian gains and their evaluation may be influenced by the investor’s risk attitude, which determines investor valuations of, and comfort levels with, tradeoffs between expected returns to trades and the variance associated with those returns.

3.2.2. Determinant 2: Perceived hedonic gains

While utilitarian outcomes are of functional or instrumental value, following Ref. [40], we define hedonic gains as those that relate to experiential consumption, fun, pleasure, and excitement. Seven factors are posited to influence hedonic gains. Three of these factors relate to investors’ social relationships and status: (a) normative social pressures, which encourage investors to adopt online investing in order to fit into a social milieu that is permeated by discussions regarding online investing; (b) embarrassment avoidance, which reflects the desire to invest without interaction with a human broker so that uncomfortable situations are avoided; and (c) the pursuit of social class membership, which captures the investors’ quest to promote themselves into certain social circles or socio-economic classes using the vehicle of online investing.

Hedonic outcomes may be influenced by psychological biases related to the illusion of knowledge and/or control. Such illusions can make investors believe in their own ability to influence their investing performance to a greater extent than can be objectively justified and can inflate their self-assessment of the extent, accuracy and/or relevance of the knowledge that they bring to bear on their investing decisions.

Hedonic outcomes related to online investing may be influenced by the investor’s risk attitude—specifically, with the quick feedback to trades and near real-time tracking of one’s fortunes, online investing may take on the tense, yet exhilarating atmosphere of a casino. Finally, hedonic outcomes may be influenced by perceptions of fairness—when investors believe they are being treated fairly by the broker and are on par with other investors (including those with larger portfolios), they will cease to scan the environment for signs of unfairness and will participate in online investing with a relaxed and open mindset.

3.2.3. Determinant 3: Trust

Trust may be defined 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” ([56], p. 712). In the absence face-to-face interaction between buyers (or consumers) and sellers (or service providers), there is no strong basis for trust to be

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4 Investor satisfaction must be adjusted for the perceived costs of investing. We adjust for these costs in the final hypothesis (H24b).
developed around personal relationships. Trust must be anchored, under these circumstances, on reassurances provided by socially and legally sanctioned institutions and on signals of seller or service-provider performance [4,51]. We postulate that trust is affected by two factors. The first, perceived operational competence, has been discussed earlier. The second, social/institutional safeguards, refers to the role played by institutions such as the Securities and Exchange Commission (SEC) and the various stock exchanges in prescribing minimum performance standards, monitoring performance levels, and punishing sub-standard performance and fraud. For example, disciplinary actions taken against member organizations and their employees are listed in the New York Stock Exchange website, and are also frequently reported in newspapers such as the Wall Street Journal.

Besides the linkages discussed above, a number of considered variables could exert influences on other variables, and/or may be influenced by yet other variables that do not directly affect perceived utilitarian or hedonic gains, or trust. For example, in Fig. 1, the pursuit of social class membership directly affects perceived hedonic gains, and also affects the risk attitudes of the investor. The complete set of hypothesized relationships is described in Fig. 1.

Having sketched the framework of the model, the following caveat is appropriate. We do not aim to extrapolate this analysis of individual online investor attitudes, beliefs, and behavior to address the overall performance of financial markets. Much debate already exists regarding the validity of the efficient market hypothesis and on the implications of investor irrationality for that hypothesis (e.g., [28,67,68])—we do not propose to add to that debate here. Our more limited objectives are to shed light on how a range of factors can influence a single investor’s experience and outcomes in the online investing context, and to derive some more general insights regarding the adoption and usage of online interfaces by consumers in settings other than online investing.

There are two broad ways in which the SEP model can be linked back to existing research. First, the proposed SEP model contains multiple constructs and linkages that have not been considered in existing models of technology adoption and usage. Correspondingly, selected linkages from the SEP model can be incorporated into existing models to provide a more complete view of technology adoption. For example, embarrassment avoidance and pursuit of social class membership can be linked back to the subjective norm in TAM2 [86]. The drawback here is that the rich web of simultaneous relationships in the SEP model is deconstructed in favor of a set of simpler, linear relationships. The second, alternative approach is to subsume models such as TAM and TPB within the proposed SEP model. The drawback here is that empirical measurement and validation is rendered more challenging as one shifts moves from the simple, linear relationships implicit in TAM and TPB towards the web of relationships embodied in the SEP model. While each approach has distinct advantages and drawbacks, we see both as theoretically and empirically legitimate pursuits. With these potential linkages discussed, we now elucidate the conceptual model.

4. Conceptual development

We now discuss each of the linkages in the proposed conceptual model.

4.1. Perceived operational competence

The perceived operational competence of the online broker reflects the investor’s belief that the broker (a) executes trades efficiently and accurately, and (b) provides current and correct information related to financial markets. Many investors considered online investing an efficient way to trade. They particularly valued the ability to quickly place trades without going through a human broker, the near-immediate confirmation of trade execution from the online interface, the easy access to margin money, and the quick overview of their account status. They viewed the process of investing through a human broker as relatively cumbersome, and complained that their traditional (human) brokers were often late in executing orders and confirming order execution. The investors believed that even small delays in rapidly moving markets could hurt them, and that operating through an online broker reduced the likelihood of delayed trades.

In parallel, investors also valued the easily accessible information available from their online...
brokers. While much of the same information was available elsewhere, investors recognized that they would likely expend substantial efforts towards searching, organizing, and interpreting such information in the absence of services provided by the online broker.

Investor beliefs regarding the efficiency of online investing are driven largely by the relatively rapid feedback regarding order execution. However, such quick feedback is not necessarily an appropriate measure of market efficiency. Many of the background processes that determine true market efficiency, including order flow, payments for order flow, and price discovery have remained largely unchanged even in online markets [51]. The order execution process remains opaque to online investors. For example, investors seldom know about what the best available prices were, and how they compare with execution prices. Further, online investors who focus excessively on superficial cues may believe that rapid order execution itself constitutes a credible signal of execution at the best prices. While such “perceived” efficiency may not completely coincide with “true” market efficiency, such perceptions would yet impact investor utility. Likewise, investors may be prone to wrongly interpreting the large volume and easy accessibility of information provided by the online broker as signals of information quality. Nevertheless, investors who perceive that the online brokers offer high levels of operational competence in the context of trade execution and information provision would be more satisfied with online investing [4].

Investors who perceive that their brokers operate to high standards of operational competence would also repose greater trust in the broker. For example, such investors would not agonize about whether each trade was executed in a timely and efficient manner and examine each trade for signs of delayed or inefficient execution (e.g., execution at wide bid–ask spreads). Rather, they are more likely to trust the broker to handle their trades efficiently and to provide sufficient, timely, and accurate information.

H1. Investors who ascribe high levels of operational competence to their online brokers derive greater utilitarian gains from online investing.

H2. Investors who ascribe high levels of operational competence to their online brokers repose greater trust in their brokers.

4.2. Convenience

In the context of online investing, convenience may be defined as the ability to efficiently perform online investing-related tasks on an anywhere, anytime basis. Many investors we interviewed suggested that convenience was one of the key reasons they adopted online investing. Some even claimed that they could trade online during office hours without being substantially distracted from their normal course of work. Other investors had begun placing trade orders on mobile devices. In contrast, these investors found intermediation by human brokers to be highly inconvenient. Commonly voiced complaints in this context included busy telephone lines, missed and non-returned calls, miscommunication during conversations, the inability to quickly react to “news,” and limited ability to participate in after-hours trading. Investors rarely, if ever, positively viewed the human broker as a “brake” that prevented hasty, frequent, or speculative transactions.

H3. Investors who value convenience derive greater utilitarian gains from online investing.

4.3. Social and institutional safeguards

These safeguards, which are constituted by the rules and regulations imposed by social and institutional structures that regulate economic activities, play an important role in ensuring that adequate trust exists between parties to ensure the smooth functioning of markets (Shapiro [71]). Structures that are socially and/or legally sanctioned (e.g., the Securities and Exchange Commission) provide assurances by ensuring that economic agents (online brokers) conform to accepted standards of performance and integrity when they undertake actions on behalf of their principals (investors). Such institution-based trust can be contrasted with interpersonal trust that exists between

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5 Online brokers have run advertisements wherein they promise to waive commission on trades not executed within a certain time-span after placement, ostensibly building on the belief that faster execution goes hand in hand with better prices.
individuals [57]. Sellers or service providers are unable to build personal relationships with consumers when transactions are routed through a virtual interface, as in the case of online investing.

As noted in Ref. [58], p. 339, “Technological and legal safeguards that produce institution-based trust are as important to the web consumer as was the quick-drawing sheriff who produced the security of institution-based trust for an 1850s frontier settlement.” Correspondingly, investors who repose faith in institutions such as the SEC would be prepared to repose greater trust in the online broker. Such trust accrues not on account of personal knowledge of the broker’s integrity, but on account of trust in the SEC’s ability and willingness to monitor and enforce broker performance standards. Such trust is particularly important in the online investing context because online investors themselves have poorly defined notions of what constitutes acceptable service quality and limited abilities to monitor the true quality of trade execution [92].

H4. Online investors who value social and institutional safeguards related to online investing repose greater trust in the online broker.

4.4. Mental accounting

Mental accounting may be defined as the accounting system implicitly invoked by consumers when they evaluate the gains and losses related to a certain sphere of activity. As noted in Ref. [83], p. 199: “All organizations, from General Motors down to single-person households, have explicit and/or implicit accounting systems. The accounting systems often influence decisions in unexpected ways.” Further, in line with the prospect theory value function described in Ref. [44], purchase decisions can be explained on the basis of “transaction utility” that is derived from the mental combination of gains and losses [83].

We find evidence of a kind of mental accounting among online investors. While online investors trade more frequently on average [8], this behavior needs to be understood within the context of how investors allocate their assets across different channels and objectives. Our survey results show that over 50% of the online investors use both traditional brokers and online brokers, often with a majority of the assets held with traditional brokers.

For convenience, we classify online investors into three categories based on the percentage of portfolio value invested with online brokers: (1) experimenters, who have invested up to 25% of their portfolio value; (2) partial adopters, who have invested between 26% and 75% of their portfolio value; and (3) intensive adopters, who have invested over 75% of their portfolio value through online brokers. In our study, only about 48% of the investors are intensive adopters, with the remaining being about equally divided between partial adopters and experimenters. Fig. 2 describes total portfolio values and percentages invested online for the three types of online investors. In general, experimenters had higher valued portfolios both online and otherwise (approx. US$319,091 on average), compared with partial adopters (US$194,875) and intensive adopters (US$104,495). Feedback obtained during interviews and from free-form survey comments suggest that experimenters and some partial adopters kept their core investments with traditional brokers and managed them with a long-term perspective, while engaging in investing online to “play” with a smaller fraction of their wealth.

Investors compartmentalize their portfolios to reflect different objectives [74–76]. For instance, people generally categorize their incomes into three groups: current wage and salary income, asset income, and future income [76]. Likewise, investors pursue certain trading behaviors based on mental compartments of their financial assets, and may seek distinct goals related to financial safety and riches from separate compartments [78]. These arguments are consistent with the comments of several investors. Specifically, some investors noted that they limited their investments online in order to control their propensity to trade speculatively and to reduce their overall exposure to risks from such trading:

H5. Investors who partition their investments between online and conventional (broker-mediated) accounts are less sensitive to the level of economic returns from their online portfolio compared to investors who only trade online.

H6. Investors who partition their investments between online and conventional (broker-mediated) accounts are less risk-averse in the context of their online portfolio compared to investors who only trade online.
4.5. Risk attitudes

The risk attitude of an investor describes the investor’s willingness to trade off between lower uncertainty of returns to investing and higher (expected) returns to investing. The rational investor is generally held to be risk-averse, i.e., the investor’s total utility is assumed to be increasing in returns and decreasing in uncertainty.

The rapid feedback on trades placed online and the ability to continuously monitor the economic implications of those trades may together induce the elements and atmosphere of gambling into investing activity. Gambling is pleasurable. As noted in Ref. [14], p. 217, “Gambling is an escape from the routine and boredom characteristic of much of modern industrial life... taking a chance destroys routine and hence is pleasurable, particularly in a culture where the unchanging and predictable routines of employment are sharply separated from leisure...” Further, there is a striking paradox between the gambler’s “perennial hope that he can “beat the game” and his realistic knowledge that it is virtually impossible to do so” [14], p. 220.

Online investing is legal, provides anonymity, attracts no social stigma, allows for certain controls on bets (e.g., by using limit orders or by managing only a fraction of investments online), and could involve informed choices rather than just luck. At the same time, the pleasure derived on account of gambling is driven more by the process of placing bets that leads to a flow of wins and losses and less by the outcome [81]. This distinction is important, because it helps define and separate the notion of gambling from that of investing itself.

H7. Online investors who invest in the spirit of gambling derive greater hedonic gains from online investing that those who do not.

H8. Online investors who invest in the spirit of gambling are less sensitive to utilitarian gains from online investing than those who do not.

4.6. Illusions of knowledge and/or control

In the online environment, investors can seek and discuss information using news pages (e.g., Bloomberg, CNNFN), virtual communities (e.g., investing newsgroups at Yahoo), and social networks. While
some of this information might yield superior trading decisions, the process of seeking and obtaining realms of information may also lead to what is termed as an “illusion of knowledge,” whereby the investor’s subjective assessment of the depth, relevance, and/or accuracy of his or her own knowledge exceeds the objective assessment of that knowledge by a disinterested expert. Investors who have worked hard to gather and process information tend to wrongly assume that the volume of information gathered is correlated with its quality and relevance, and that such information places them in good stead to beat the market. These assumptions lead investors to believe that they are more knowledgeable than they really are. As one investor in our study noted: “The more research you do, the more you learn about online investing. That makes you better at investing.”

Some online information providers may seek to exploit the abundance of information on the Internet—an advertisement from eSignal suggested: “You’ll make more, because you know more” [6]. Further, when online investors access information sources like stock discussion boards where they can find other investors aligned with their own views with relative ease, they are disposed to accept such confirming evidence, further strengthening their existing beliefs [6].

The dominant definition of control in the literature centers on the individual’s belief in his or her ability to influence events [17,26]. The “illusion of control” can be defined as an expectancy of a personal success probability inappropriately higher than the objective probability would warrant [52]. In other words, an illusion of control results when individuals overestimate their abilities to control events when, in fact, such events are uncontrollable. Illusion of control is a persistent characteristic of human activity and has been observed across the domains of finance [7], psychology [52] and medical practice [10]. Online investing provides a fertile ground for such illusions of control because certain elements that generally lead to an increased correlation between skills and performance (e.g., choice, task familiarity, search, and involvement) are present in this setting. As noted in Ref. [6], p. 47, “The problem (in this situation) is that investors are likely to confuse the control they have—over the investments they make—with the control that they lack—over the return those investments realize.” Rapid feedback on trades obtained from online trading systems may further inflate such perceptions of control, as might stories of successful investing strategies from members in the online investor’s social network. Online investors are particularly susceptible to illusions of control when they adopt online investing in a bull market and encounter early successes in their investing decisions.

Illusions of control in the context of online investing may lead to “escalation behaviors,” whereby individuals who see themselves as personally responsible for negative or positive decision outcomes consistently commit a larger fraction of resources towards that decision than those who do not see themselves as being personally responsible [11,70]. Such persistence may serve as a psychological defense against errors in judgment or, alternatively, may represent an effort to appear rational by increasing commitment to the failing course of action [80]. Online investing offers easy, low cost access to stock trades and quick feedback on trading decisions—hence, online investors may be particularly susceptible to escalation behaviors.

Besides affecting the online investor’s approach to trading, illusions of knowledge and control can provide an emotionally pleasurable backdrop for investing activity. Scholars have argued that individuals like being in control because of its association with freedom and autonomy [15,25,41]. Control is desirable because it engenders “feelings of mastery” [18], p. 251. Perceived control has been linked to general well-being [52], positive motivation [24], and the abilities to cope with stress and pain [33]. As suggested in Ref. [53], p. 775, “situations which diminish one’s personal sense of control are likely to diminish..."
one’s immediate feeling of happiness” and “persons experiencing less control over their lives are likely to experience less average happiness.”

While control (or perceptions of control) renders the focal activity more pleasurable, it also engenders certain biases in way outcomes are evaluated. Individuals are generally more satisfied with outcomes deriving from choices that they control [20], but particularly when their choices turn out to be good ones [59,84]. When trades suggested by human brokers do not yield expected results, investors perceive brokers to be responsible for the loss. Investors were quick to assign blame in such cases—for example, one investor commented that “our broker gave us terrible advice and we lost a lot of money.” Another investor suggested: “Brokers make money on you whether or not you profit. It’s a win–win situation for them.”

When investing strategies suggested by human brokers do not lead to financial gains, investors appeared to lower their pain and anguish by blaming those brokers. On the contrary, when online investors made decisions that did not yield positive outcomes, they were willing to take responsibility for their losses. Consider this comment from one investor: “Right or wrong, they [the decisions] are based on my research and I am ready to accept their consequences.” Seen from another perspective, however, it could be argued in the spirit of attribution theory that these investors were less critical about their decisions, and more willing to put up with “wrong” decisions as long as they were in control of those decisions (e.g., [84]). Specifically, because online investors do more of their “own” research and arrive at their “own” decisions, they are more likely to assign “successes” to their own efforts, abilities, or dispositions, while attributing “failure” to luck, task difficulty, or external factors (e.g., [38]). Such attributions may enhance their self-esteem and cement their positive opinions about their own abilities.

**H9.** Online investors will have greater illusions of knowledge and/or control compared to conventional investors.

**H10.** Online investors with stronger illusions of knowledge and/or control will derive greater hedonic gains from online investing.

**H11.** Illusions of knowledge and/or control on the part of online investors will lead to overconfident (trading) behavior.

**H12.** Illusions of knowledge and/or control on the part of online investors will lead to increased self-attribution.

### 4.7. Self-attribution

Attribution theory is concerned with individuals’ attempts to understand the causes and implications of certain events that occur. Correspondingly, self-attribution refers to the tendency to associate the causes of events with the self rather than to chance, or to others. Individuals often go beyond attribution to assign responsibility or blame for certain actions [72,73].

Investors use (human) brokers partly because they believe the latter posses superior domain knowledge and skills. Such perceptions are not unreasonable, since historically brokers have had access to information and trading mechanisms not readily accessible to the general public, and are more experienced than the average investor. Correspondingly, investors may implicitly assume that brokers are well calibrated in their judgments [43]. However, given the volatile nature of the stock market, many broker judgments turn out to be the unprofitable in hindsight. When human brokers initiate trading decisions and such decisions do not yield expected results, investors perceive brokers to be responsible for the incurred losses.

Self-attribution biases can exert multiple influences. First, self-attribution can engender overconfidence. The model discussed in Ref. [35] demonstrates how, when traders learn about their ability over multiple periods, a self-attribution bias in this learning can lead to overconfidence over time. In that model, traders (or alternatively, investors) inflate the estimations of their own abilities when they have successfully predicted the market in the past—consequently, when applying Bayes’ rule to update beliefs about their ability, they underweight their failures and overweight their successes. Correspondingly, these traders think too highly of themselves compared with unbiased investors, and their degree of overconfidence is proportional to their attribution bias.
Second, online investors who conduct their own research and make their own trading decisions are susceptible to an asymmetric attribution of positive and negative outcomes. The wealth of information about the stock market available online makes it easy to generate imagined alternatives to reality, or counterfactuals, that can be applied to rationalize online investors’ decisions that did not yield positive outcomes. Alternatively, selected counterfactuals can also be applied to inflate the quality of the investor’s decisions when they did yield positive outcomes—for example, it is easy to find alternative stocks that did not perform as well as those chosen by the investor.

Generating counterfactuals is particularly easy in the context of online investing because a large number of alternative choices are available to the investor (cf. [90]) and the implications of choosing them are easy to visualize (cf. [42]). Such self-attribution biases and counterfactual thinking will ameliorate negative sentiments about decisions that yielded unfavorable outcomes, and inflate positive sentiments about decisions that yielded favorable outcomes. Consequently, the investor who is subject to such biases will be satisfied with a lower level of return from investing activities.

**H13.** Self-attribution on the part of online investors will lead to higher levels of overconfidence.

**H14.** As self-attribution on the part of online investors increases, they will be less sensitive to the level of economic returns from their online portfolio.

### 4.8. Overconfidence

Overconfident investors trade in a way that reflects stronger beliefs in their own evaluations of stocks and the market compared with the beliefs of others [7]. Overconfidence may operationally manifest itself in terms of more frequent and more speculative trades. Overconfidence is particularly relevant when tasks involve forecasts with low predictability and long-term feedback [3,30].

Overconfidence may correct itself with experience. Overconfidence is high when investors are inexperienced and successful, and falls with experience. Correspondingly, online investors with limited experience are likely to be particularly susceptible to overconfidence. Overconfidence may be endogenously determined and moderated dynamically over a trader’s life [35].

To test for overconfidence among online investors, conventional and online investor (households) were contrasted using a matched pair research design in Ref. [8]. On the basis of market value of stock positions, each of 1607 investors who switched from phone-based to online trading was matched with an investor who did not trade online. Among the findings were that online investors experienced superior performance prior to proceeding online—specifically, they beat the market on average by about 4.2% on an annual basis, compared with conventional investors who beat the market by 2.4% annually. Next, the aggregate annualized turnover (defined as 12 times the ratio of one-half of the total value of sales and purchases by all online investors in a month divided by the sum of the month-end position statements) was compared across the two groups. Annualized turnover is a reasonable measure of the level of trading activity within each group. Prior to proceeding online, annualized turnover for online investors was about 70%, whereas that for the size-matched (conventional) investors was about 50%. After the former proceeded online, the annualized turnover of the online investors spiked to 120%, i.e., they traded more frequently, or traded in greater volumes, or both. Furthermore, 2 years after the switch, the annualized turnover for the online investors was still 90%, substantially above their turnover before proceeding online.

The online investors in the study also traded more speculatively. Screening out sales and purchases that appear to have been made for reasons of liquidity, a desire to rebalance, or tax losses, speculative sales are defined as those that involve profitable sales of complete positions that are followed by a purchase within 3 weeks, and speculative purchases as those that are made within 3 weeks of a speculative sale. It was established that speculative turnover nearly doubled from 16.4% to 30.2% when investors went online, and that speculative trading accounted for 60% of the turnover increase exhibited by an average investor after proceeding online.

Finally, online investors in the study underperformed the market by a substantial 29 basis points for net returns that adjust for the cost of trading. In terms of net own-benchmark returns, online investors...
lost 30 basis points a month (3.6% annually), whereas the size-matched conventional investors lost only 12 basis points (1.4% annually). For detailed findings, see Ref. [8].

**H15.** Compared with conventional investors, online investors will exhibit behavior that is consistent with higher levels of overconfidence.

**H16.** *Ceteris paribus*, online investors will generate lower average net economic returns from their trading activities than conventional investors.

### 4.9. Perceptions of fairness

Impartiality (or fairness) may be defined as the moral imperative requiring that conflicting claims to scarce resources be evaluated without prejudice [46]. Consumers are highly sensitive to discriminatory treatment by sellers or service providers, and loudly protest when they perceive such treatment. However, the role of fairness is all too frequently ignored in modern economics on account of the widely accepted principle that the common good is well served by the free actions of self-interested agents in a market [45].

Many investors we interviewed held that their human brokers were partial. They complained that, with their human brokers, large investors had frequent access to hot initial public offerings (IPO) and better deals on their trades. Even when smaller investors received access to IPOs, these were typically the ones that were ignored by larger investors. In contrast, many investors who switched to online trading observed no such preferential treatment, and believed that online trading systems were more balanced in their treatment of investors. Much of this perception of fairness was driven by the assumption that the average online investor is not personally known to the broker, there was no reasonable basis for discriminating against a specific set of investors.

Perceptions of fairness will favorably dispose the online investor towards the broker and towards the online investing process. Compared with investors who believe they are receiving an unfair deal, those who believe they are being treated fairly will not continually scan the environment for clues that signal discrimination and will not draw frequent comparisons between their conditions and those of other investors.

**H17.** Online investors who perceive they are being treated fairly by their online brokers will derive greater hedonic gains from online investing.

### 4.10. Embarrassment avoidance

Embarrassment results when an individual’s projected self is threatened during interactions with others [36]. Since embarrassment is a socially occurring phenomenon driven by a concern about what others are thinking about us, the real or imagined presence of others who evaluate the actions of the focal individual is an important precursor to embarrassment [21,60]. At the heart of embarrassment is a vacillation between experiencing one’s existence as self and as role—embarrassment results when one displays his or her self, stripped of the mask provided by the role [89].

Investors who use human brokers are relatively more susceptible to embarrassment compared to online investors. Relationships between investors and their (human) brokers are rarely constrained to a single transaction. Instead, these relationships typically endure over time and may even overlap into social domains beyond investing. The actions of the investor with respect to the (human) broker are therefore influenced by the shadow of the future, i.e., by concerns over maintaining a positive image in the eyes of the broker, and correspondingly, in the contexts of the overlapping social circles to which they may belong.

The online investors we surveyed indicated that they were wary of being embarrassed in their interactions with human brokers on two counts. First, these investors did want to be seen as lacking in knowledge about the economics of the stock market and about the principles of sound trading. As one investor noted in the context of online trading: “I don’t have to explain why I want to buy the stock.” In many situations, individual investors may decide to either buy or sell stocks on a speculative basis, in the hope of locking in some substantial short-term gains. The investors would typically find it difficult to justify these trades in conversations with the broker—in fact, a conscien-

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7 Consistently, in a study of 401(k) plan participants, online access to accounts increased turnover by as much as 50% [19].
tious broker would do well to actively discourage such trades. In such cases, the broker realizes that the investor lacks systematic and disciplined trading practices, and possibly even fundamental knowledge about the underlying economics of the stock market.

Second, some investors preferred to privately handle certain kinds of transactions. As one investor noted: “I sometimes wish to purchase or sell just a few shares, and would be embarrassed to call a broker for these trades.” Underlying this apprehension was the expectation that these trades would pale in comparison to the more substantial trades placed by the broker’s other customers. The investors had no desire to be seen as “small fry” by the broker. Online investing, in contrast, offers a pseudo-anonymous trading environment within which investors can decide on the frequency, volume, and content of trades without fear of disapproval or embarrassment.

**H18.** Compared with conventional investors, online investors will exhibit lesser fear of embarrassment.

**H19.** Lesser fear of embarrassment on the part of online investors will be positively related to hedonic gains from online investing.

### 4.11. Normative social pressures

These are pressures that cause an individual or a firm to adopt an innovation not on account of an independent assessment of the innovation’s usefulness, but because numerous other entities have already adopted that innovation [1,27]. Social influences play a key role in catalyzing the adoption of innovative products and processes by firms and consumers [65]. Individual behavior and choices may be motivated in large part by social factors including the desire for prestige, acceptance, popularity, and self-esteem, sometimes to the extent that such factors perceived as more important than the intrinsic utility of choices [12].

The need to conform can be so strong that individuals may emphasize conformity even when they have potentially beneficial private information. For example, fund managers may strive for conformity with other professional managers even when they have private information [69]. By mimicking the decisions of other high-profile investment managers, they reduce the likelihood that their decisions stand out from the crowd when they do not yield expected returns. The tendency for a single investor or manager to follow the behavior of preceding individuals without regard to own information may result in informational cascades [13] or herd behavior [5,69,77].

Social factors are particularly relevant in the context of socially embedded activities such as online investing that provide frequent fodder for conversation among colleagues and friends. Some investors we interviewed suggested that their adoption of online investing helped them participate freely in discussions related to stocks and the economy within their professional and social circles. In fact, advertisements from online brokers have frequently, if implicitly, suggested that investors who do not take control of their financial futures are social and technological laggards. Investors who adopt online investing in response to social pressures find that increased familiarity with the domain helps them build and project a confident image in social settings.

While normative social pressure may initially “force” some investors into online investing, these investors could, over time, derive pleasure from the process of investing and the attendant social context. A number of aphorisms suggest that individuals respond positively to the presence of like others and to the confirmation of their views by others—these include “happiness shared is doubled, sadness shared is halved,” “great minds think alike,” and “birds of a feather flock together” [63]. Effectively, the hedonic utility of an activity is enhanced by confirmatory feedback from others, the presence of others also taking part in the activity, and social support for that activity [32,63,66].

**H20.** Investors who adopt online investing on account of normative social pressures will derive greater hedonic gains from online investing.

### 4.12. Pursuit of social class membership

As an activity that is socially embedded and approved, online investing is frequently seen as a vehicle to social class membership, i.e., as a means to “catch up” with investors who have achieved certain wealth levels or to “make it” to higher socio-economic classes. Whereas online investing
can generate excitement and pleasure much like more conventional forms of gambling, online investing is legal (unlike certain forms of gambling), arguably allows for the application of investor knowledge and skills, and is almost never associated with any social stigma.

Online investors who pursue such social class membership-related objectives are likely to exhibit more risky investing behaviors. This argument was first proposed to reconcile the empirical evidence that individuals who purchased insurance to protect themselves from risk were also frequently willing to buy lottery tickets (or undertake other activities with uncertain outcomes) [34]. Individuals are sensitive to movement between social classes. Within each social class, the utility of an individual (as a function of income) exhibits the standard, risk-averse concave shape. However, increases in income that shift the individual out of an existing class and into a new, higher class with an enhanced social and economic status yield increasing marginal utility [34].

Fig. 3 describes the Friedman–Savage utility function that supports these arguments. To the left of point $P$, increases in income increase utility but keep the individual within the lower level socio-economic class. Hence, in this range of income, the individual exhibits standard, risk-averse behavior. However, income increases in the range between $P$ and $Q$ lift the individual into a higher socio-economic class, and hence yield increasing marginal utility. In this range of income, the individual is particularly susceptible to taking gambles that offer a shot at increases in income large enough to lift him or her into the higher socio-economic class. Beyond $Q$, however, the individual again exhibits standard risk-averse behavior because s/he has already arrived at the destination socio-economic class, and incremental enhancements in income now again yield diminishing marginal utility.

The implications of the Friedman–Savage model have been empirically examined at both the macro-level of the economy and at the individual level. For example, societies with high degrees of social inequality are more involved in games of chance [62]. Arguably, participation in these games provides an avenue for members of lowers socio-economic classes to move into the higher ones. At the individual level, individuals who are dissatisfied with their current income levels are more likely to engage in games of chance that can yield substantial increases in their wealth [16].

To the extent that online investors believe the expected returns from their investments would help them catch up with other investors in their social circle, they would exhibit less risk-averse investing behavior in the online domain. Our study suggests that investors adopt distinct trading strategies across their online and conventional accounts, and that investors adopt more risky strategies when trading online. This duality of approaches is consistent with arguments advanced in the literature. Portfolio diversification is generally associated with risk aversion (e.g., [85]). However, assuming that a gambler with risk preference considers both expected return and risk of outcomes as “goods” of which more is desired to less, the optimal portfolio for such a risk-seeker may be a diversified one, comprised of lottery assets (these have negative expected yields) and non-lottery assets [37].

A behavioral portfolio theory (BPT) is developed in Ref. [75]. BPT is based on the foundations of: (a) SP/A theory [54], which focuses on the desires for security (S) and potential (P), and on the aspiration levels associated with security and potential, and (b) prospect theory [44], which posits distinctly shaped utility curves for gains and losses measured with respect to a neutral point. BPT is presented in two versions—one in which investors use a single mental account, and a second where investors employ more than one mental account [75]. The portfolios under the multiple account versions of their BPT resemble layered pyramids where the layers are associated with
aspirations. In particular, the two-account version corresponds to the situation where the lower aspiration layer is designed to avoid poverty and the higher aspiration layer is designed for a shot at riches. This interpretation appears to fit well with the portfolio strategy of the online investors in our study.

**H21.** Investors who engage in online investing in pursuit of membership in higher socio-economic classes are more likely to mentally compartmentalize their portfolio into online and conventional accounts.

**H22.** Investors who engage in online investing in pursuit of membership in higher socio-economic classes will derive greater hedonic gains from online investing.

**H23.** Investors who engage in online investing in pursuit of membership in higher socio-economic classes will exhibit lower levels of risk aversion with respect to their online portfolios compared to (a) their conventional portfolios, and (b) other online investors who do not pursue such membership.

### 4.13. Investor satisfaction

Finally, the three key sub-components of the online investor’s utility can be tied to overall satisfaction. Formally, such satisfaction must be adjusted for the perceived costs of doing business with the online broker.

**H24a.** An increase in either perceived utilitarian gains, hedonic gains, or investor trust in the online broker will lead to greater investor satisfaction with online investing.

**H24b.** An increase in the perceived costs of investing, including trade commissions and interest on margin money, will lead to lower investor satisfaction with online investing.

### 5. Discussion and conclusion

We advance the view that a more complete understanding of electronic markets is obtained when their implications for consumers are jointly studied from sociological, economic, and psychological perspectives. Focusing on the context of online investing, we derived a set of hypotheses that linked factors related to the sociological, economic, and psychological aspects of online investing, or some combination of these aspects, to the utilitarian gains, hedonic gains, or reposed trust on the part of the online investor.

While online investing constitutes the domain of interest for conceptual development in this paper, the proposed SEP model has wider external validity. The model can be applied, with due adjustments, to other contexts where consumers take charge of their decision-making in virtual contexts. For example, illusions of knowledge and/or control may be invoked in any situation where consumers take the initiative to search for information, and evaluate or purchase offerings (e.g., online hotel reservations). Embarrassment avoidance is relevant, for example, in the context of health-related products and services and sexually oriented offerings. The pursuit of social class membership may be relevant in the context of online gambling and other activities with uncertain outcomes. Likewise, consumers may apply distinct mental accounts to their online purchases and store purchases. Social and institutional safeguards are relevant when consumers buy experiential products, particularly from distant sellers with no proximate physical presence. However, as noted earlier, not each of the factors discussed in the context of online investing would be equally relevant within other product or service contexts. Some may be more or less important, and other context-specific factors may need to be included in the model before it is applied elsewhere. Our work provides a foundation that can anchor such efforts.

This study has some limitations that can be addressed by future research. First, we constructed the model based on detailed interviews with and surveys of online investors, and on existing empirical findings and theoretical arguments in the literatures across economics, finance, marketing, psychology and sociology. However, we did not empirically test the model. This limitation can be addressed in future research. Second, while we derived a set of 24 hypotheses, not all would be equally important in a specific market setting. In addition, we may have ignored some moderating and mediating effects related to the considered variables. Future work can focus on both establishing the situation-specific nature of the proposed effects, and on deriving more sophisti-
icated hypotheses that incorporate moderating and mediating effects.

We hope that this paper provides a foundation for the further exploration and understanding of technology adoption and usage jointly from social, economic, and psychological perspectives.

Acknowledgements

This research is supported by National Science Foundation CAREER Award under contract number IIS-9875746 (Konana), and partially supported by National Science Foundation ITR grant under contract number IIS-0218988 (Konana and Balasubramanian).

References


Prabheudev Konana is Associate Professor of MIS and Distinguished Teaching Professor in the McCombs School of Business at the University of Texas at Austin. He has an MBA and a PhD from the University of Arizona. His research interests are in electronic business value assessment, online investor satisfaction, online supply chain management, and the design of electronic brokerages. He has received numerous grants and awards including NSF CAREER Award, NSF Information Technology Research grant, and El Paso Energy Foundation Award. His research is also supported by Dell, Intel and IBM. His work has appeared in Management Science, Communications of the ACM, INFORMS Journal on Computing, Information Systems, Operations Research Letters, and Journal of Systems and Software.

Sridhar Balasubramanian (PhD, Yale University) is Assistant Professor of Marketing at the University of North Carolina’s Kenan-Flagler Business School. His teaching and research interests lie in the areas of game theory and the management of competition, marketing strategy, channel portfolio management, e-commerce, direct marketing and customer relationship management and strategic compensation. Dr. Balasubramanian’s work has been published or is forthcoming in journals such as Management Science, Marketing Science, Journal of Marketing, Statistica Neerlandica, International Journal of Electronic Commerce, Journal of Retailing, and the Journal of the Academy of Marketing Science. He has received multiple research awards, including the John D.C. Little Award for 1998 from INFORMS for the best marketing paper in Marketing Science and Management Science. He was co-guest editor of the Centennial Issue of the Journal of Retailing. He has been recognized as a Teaching All-Star in the undergraduate, MBA and executive education programs at the Kenan-Flagler Business School, and has served as a consultant to multiple companies.