An integrated approach of TAM and TPB with financial literacy and perceived risk for influence on online trading intention

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Abstract
Purpose – This paper aims to propose a decision-making framework by investigating the impact of perceived risk and computer self-efficacy on the intention to use online stock trading. Furthermore, it demonstrates the mediation effect of attitude and perceived risk as well as the moderating effect of financial literacy.

Design/methodology/approach – An integration of two popular models, technology acceptance model (TAM) and theory of planned behaviour (TPB), is used to provide a sound theoretical base and enhance the understanding of investors’ behaviour towards online trading platforms. The proposed hypothesised model was examined using structural equation modelling.

Findings – The results obtained from this study indicate that all variables, except subjective norms, had a significant impact on investors’ intention to trade online. Perceived risk was found to be a partial mediator between computer self-efficacy and the intention of investors. Finally, financial literacy was also found as a significant moderator for online trading intention of investors.

Practical implications – This study shows the significance of using the TAM and TPB together to provide a comprehensive understanding of the factors that influence an investor’s behaviour in adopting and using technology for online trading. The hybrid approach of TAM and TPB could be considered for a more nuanced and complete understanding of technology adoption and usage in risky affairs like investment decisions. Again, the significant moderating role of financial literacy provides a lance to look into the scope for improvements in investment decision-makings.

Originality/value – The paper develops an assessment framework for analysing the variables based on the hybrid approach for online trading intention in the context of a developing country.

Keywords Information and communication technology (ICT), Technology acceptance model (TAM), Theory of planned behaviour (TPB), Investment decision, Stock market

Paper type Research paper

1. Introduction

The proliferation of the internet has made it possible for individuals to manage their investments online, including buying and selling stocks. Information and communication technology has become an integral part of the lives of about 67.9% of the world’s population. Internet users grew from 0.4% of the world’s population in December 1995 to 67.9% in December 2022 (Internet World Stats). The increasing usage of the internet has brought a strong structural change in societies around the globe. Developing economy like India is leading the race from the front, with 658 million active internet users in December 2022 (statista.com). The effect of internet adoption can also be seen in the Indian capital market, where people who were once using traditional trading means are now switching to e-trading. Internet-Based Trading and Services were introduced in Jan-2000 in Indian stock exchanges (NSE India).
Online stock trading offers many advantages, including convenience, speed and low transaction costs, which has led to its growing popularity (Tai and Ku, 2013). Despite these benefits, many individuals remain hesitant to participate in online stock trading due to concerns about perceived risk and a lack of confidence in their computer skills (Lee, 2009). Understanding the factors that influence the intention to use online stock trading is important for encouraging greater participation in this market and for developing strategies to reduce the perceived risks associated with this form of investing. Perceived risk, defined as the subjective assessment of the likelihood of losing money or the uncertainty associated with a particular investment, has been identified as a key factor in investment behaviour (Doney and Cannon, 1997; Tversky and Kahneman, 1974). In the context of online stock trading, perceived risk may be related to factors such as the perceived security of online transactions, the reliability of online stock trading platforms and the perceived accuracy of financial information available online. Computer self-efficacy (CSE), defined as an individual’s belief in their ability to use computers effectively and efficiently, has also been identified as a predictor of online behaviour, including online stock trading (Lee and Lee, 2011; Suh et al., 2010). Individuals with higher levels of CSE are likely to have more confidence in their ability to navigate online stock trading platforms and make informed investment decisions. This study aims to investigate the impact of perceived risk and CSE on the intention to use online stock trading.

Despite the growing popularity of online stock trading, many individuals remain hesitant to engage in this form of investing due to concerns about perceived risk and a lack of confidence in their computer skills. Such an attitude forms apathy among both individual investors and investment institutions towards online stock trading (Allameh et al., 2010), which could be one of the key reasons for the sad picture of instability in online stock trading growth in countries such as India. As a result, there is a need to better understand the factors that influence the intention to use online stock trading to encourage greater participation in this market.

This study integrates two popular models, technology acceptance model (TAM) and theory of planned behaviour (TPB), to provide a sound theoretical base and enhance the understanding of investors’ behaviour towards online trading platforms. Together, the two models have been used to illustrate acceptance of online digital platforms in different contexts (Mathieson, 1991; Taylor and Todd, 1995; Lee, 2009; Yang and Su, 2017), so their usage in the study is intended to give a more detailed picture. Moreover, two additional factors, i.e. CSE and perceived risk, have been incorporated into the study due to their importance in decision-making towards the usage of new technology. Thus, the study serves the following purposes:

- to know whether using TAM and TPB together improves the explanatory power of the model in predicting investors’ intention to adopt online stock trading platforms;
- to know whether CSE significantly affects investors’ intention towards online stock trading; and
- to know whether the perceived risk and financial literacy have a significant role in determining intention towards online stock trading as a mediator and moderator, respectively.

The research problem is to investigate the impact of perceived risk and CSE on the intention to use online stock trading. The study aims to determine the extent to which perceived risk and CSE influence an individual’s willingness to invest in online stock trading and to identify the most important predictors of intention in this context. This research will contribute to our understanding of the factors that influence investment behaviour and will have practical implications for the development of online stock trading platforms and educational programmes to promote financial literacy and investment confidence.
The findings of this study will contribute to our understanding of the factors that influence investment behaviour and will have practical implications for the development of online stock trading platforms and educational programmes aimed at promoting financial literacy and investment confidence. To provide better understanding of the topic, the article is divided into seven sections. The second section provides a review of the pieces of literature and hypothesis development. The third section deals with the research methodology applied in this study. Section four reports the detailed data analysis, section five explains about result and discussion, Section six furnishes the conclusion and implications drawn from the study's findings, and finally, section seven outlines the limitations and suggests avenues for future exploration.

2. Literature review and hypothesis development

Due to the relevance of online trading, various studies have been conducted to investigate the matter from different aspects. However, as an ever-changing industry (Liu et al., 2015) requires continuous research. The section will provide a systematic understanding of the topic and help develop a research hypothesis.

2.1 Online trading

The intention to engage in online stock trading has been widely researched in finance and psychology. Chiu et al. (2010) presented a detailed review report for online stock trading. Naseer and bin Tariq (2015) presented online trading's importance from the EMH viewpoint and market players' behavioural and psychological aspects. Lee and Kim (2008) studied the factor of trust factors of individual investors in online stock trading. Albort-Morant et al. (2022) statistically proved the explanatory power of customers' perceived usefulness (PU) in adopting an online system in financial and banking transactions. The lack of consistency in providing superior explanations of individual behavioural either by TPB or TAM (Chen et al., 2007), a growing body of research has come up with the integration of these two models to provide a holistic view of IT usage and e-service acceptance (Bosnjak et al., 2006; Chen et al., 2007; Wu and Chen, 2005). Our study also offers a comprehensive structure to capture an instance of the adoption of advanced technology accompanied by social systems and individual characteristics owing to its complementary nature and superior exploratory power compared to the individual use of TAM and TPB. Therefore, capturing the essence of both the models, investors' attitude towards the technology that relies on performance and effort expectancy (i.e. calculated decision and easy to handle financial information) can be efficiently measured. Furthermore, the external influence in decision-making such as perceive pressure to engage in a behaviour (i.e. investing in stock market) can be highlighted using these models simultaneously (Wirtz et al., 2018).

2.2 Technology acceptance model

TAM has been extensively used to predict the user's intention to adopt new technologies, and Jiang et al. (2022) used the model in the field of online trading and financial transactions. By relying on and modifying the previous works of Fishbein and Ajzen (1975), who proposed the theory of reasoned action (TRA), Davis (1989) documented a powerful and parsimonious framework, the TAM. He suggested that the two factors: perceived ease of use (PEOU) and PU, act as the most significant antecedents to predict the attitude of individuals and hence their intention to use any technological system. These are the two significant elements of TAM (Huy et al., 2019).

Robey (1979) and Roca et al. (2009) found a high correlation between a system’s PU and usage. In a seminal work, Swanson (1982) provided evidence in support of PEOU and PU and stated the duo as important factors in determining individuals’ behaviour. Marangunić
and Granić (2015) had a similar opinion about the effect of PU and PEOU on explaining behaviour.

2.3 Theory of planned behaviour

The TPB is a theoretical framework which was proposed by Ajzen (1985) to explain almost any kind of human behaviour in decision-making processes and was originally evolved from the TRA (Fishbein and Ajzen, 1975). TRA and TPB are often used to predict individuals' behavioural intentions and behaviour. But the use of perceived behavioural control (PBC) in TPB boosts the predicting power of the model when compared to TRA (Madden et al., 1992).

Riley and Klein (2021), Villanova et al. (2021), Djafarova and Bowes (2021) and so on studied the TPB in various buying and user behaviour aspects, an important part of TAM.

2.4 Computer self-efficacy and intention to trade online

In the model of the present study, CSE has been used by replacing PBC because self-efficacy and PBC are assessed as similar constructs (Ajzen, 2002). Nevertheless, self-efficacy is advocated to be a sub-component of PBC by few researchers (Pertl et al., 2010). Researchers like Manstead and Van Eekelen (1998) have found empirical evidence for self-efficacy to be more closely associated with behavioural intention than attitude, subjective norms (SN) and perceived behaviour control. In some context, self-efficacy is found to be a better predictor of behavioural intention than PBC (Lee and Lina Kim, 2017). In a study to know the factors influencing behavioural intention of individuals to trade online in Singapore, Taylor and Todd (1995) used CSE as a sub-component of PBC.

CSE has been used to determine the adoption or acceptance of online platforms in various contexts (Ariff et al., 2012; Luarn and Lin, 2005; Tung and Chang, 2008). Ariff et al. (2012) specifically examined the effect of CSE on the intention to use the online banking systems and found a significant role of CSE in determining behavioural intention to use online banking. Luarn and Lin (2005) conducted a study on nursing students in Taiwan using CSE as one of the external variables to the TAM. The results of the study show a significant and positive relationship between CSE and BI to use online courses. In this study, we have used CSE as a replacement for PBC.

2.5 Computer self-efficacy and perceived risk

Self-efficacy refers to one’s judgement of his ability to do something he needs to do efficiently (Bandura, 1982). It affects the feelings, emotions and actions of individuals (Bandura, 1997). An individual’s self-efficacy influences his risk perception of a situation (Jani, 2011). This leads the person to make the choice of action during a situation. Jani (2011) conducted a study on project managers of IT projects to find a relationship between self-efficacy and risk perception and their influence on commitment towards IT projects. He found that self-efficacy negatively affects the risk perception of an individual. This suggests individuals with high self-efficacy have low-risk perception and thus make risky decisions. Krueger and Dickson (1994) showed that an increase in self-efficacy leads to an increase in risk-taking behaviour. When it comes to the intention to trade online, it is risky for those who are less skilled in using computer software. So, CSE has a role to play in investors’ decision to choose internet-based trading. Although the relationship between CSE and perceived risk seems obvious, the relationship has not been used previously in the context of online trading.
2.6 Perceived risk as a mediator and financial literacy as moderator

Perceived risk has also been used by a few researchers to explain the intention of individuals towards various actions (Lee, 2009; Martins et al., 2014). Choi et al. (2013) examined the effect of perceived risk on behavioural intention to consume street foods. The study has shown a negative relationship between perceived risk and behavioural intention. Tavitiyaman and Qu (2013) also found an inverse relationship between perceived risk and behavioural intention in Thailand’s tourism context. Perceived risk becomes a significant variable when dealing with behavioural intention towards online tools or platforms. Perceived risk of information security strongly deters purchase intention using e-commerce (Tsai and Yeh, 2010). Kim et al. (2008), in their study of decision-making in e-commerce, found perceived risk to be a significant factor in individuals’ intention to purchase online. Moreover, in case of technology usage, risks perception can arise from factors like the lack of IT knowledge, updated information and urge for innovation (Martins et al., 2014). Therefore, we propose that having the knowledge of computer and IT system may have a varied impact on intention in the presence of risk perception of investors. Again, financial literacy is defined as the knowledge of financial products that is required for financial information processing and decision-making (Raut, 2020). Mandell (2008) defines financial literacy as a required knowledge to make financial decision in the best interest of an individual. The positive correlation of financial literacy and stock market participation shows improved financial behaviour (Lyons et al., 2006), and having little knowledge of stocks and stock markets decreases such participations (Van Rooij et al., 2011). Alshebami and Aldhyani (2022) advocate financial knowledge as an important key for rational decision-making. This shows that having a sound financial knowledge can change the investors’ attitude towards online trading. It can also mitigate the risk using technologies for financial decisions.

2.7 Hypothesis development

Many sets of literature, Wang et al. (2015), Lee and Lee (2011), Suh et al. (2010), Amstrong and Serenko (2010), Doney and Cannon (1997) and Tversky and Kahneman (1974), provide evidence for the relationship between perceived risk, CSE and the intention to use online stock trading. They demonstrate the importance of considering perceived risk and CSE as predictors of intention to use online stock trading and provide a basis for further research in this area. Thus, supported by the prior studies using the TAM to predict individual behaviour (Figure 1), the following hypotheses have been proposed:

H1. Perceived usefulness (PU) impacts attitude to trade online.
H2. Perceived usefulness (PU) impacts the intention to trade online.
H3. Perceived ease of use (PEOU) impacts attitude to trade online.
H4. Attitude impacts intention to trade online.
H5. Subjective norms impact intention to trade online.
H6. Computer self-efficacy impacts intention to trade online.
H8. Perceived risk negatively impacts the intention to trade online.
H(Mediation) 1. Attitude mediates perceived usefulness and intention to trade online.
H(Mediation) 2. Perceived risk mediates the relationship between computer self-efficacy and intention to trade online.
H(Moderation) 1. Perceived risk moderates the relationship between computer self-efficacy and intention to trade online.
3. Material and methods

3.1 Instruments and scale development

An online survey questionnaire was developed to collect data from investors with online trading exposure. Nominal scales were used to collect information about respondents' demographic data, and a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5) was used to quantify the variables of TPB, TAM, investors' perceived risk and financial literacy. The TAM and TPB items were derived from the studies of Davis (1989), Taylor and Todd (1995), Gefen et al. (2003) and Pavlou (2003). Items for CSE were referred from the works of Liu et al. (2012) and Compeau and Higgins (1995), items for the perceived risk taken from the study of Littler and Melanthiou (2006) and items for financial literacy from the research of Van Rooij et al. (2011). The developed questionnaire was first discussed with the expert in the relevant field and with the investors who have sufficient investing experience. Before conducting the main survey, a pre-test was performed with 40 investors, who had experience in online trading, to establish the content validity of the measurement items.

3.2 Data collection

In the first step, respondents were approached using a convenient sampling technique to collect data. For this purpose, 83 participants with online trading expertise were identified. In the second step, the snowball sampling technique was used, and the selected responders were requested to forward the questionnaire to investors with similar profiles. A total of 302 responses were received; however, after screening and removing incomplete responses, extreme outliers and information redundancy errors, 283 were found valid and useful for the data analysis. The collected data are deemed adequate and fit for analysis in accordance with the recommendations of Hair et al. (2008) and Oke et al. (2012) that the sample should be between 200 and 400.
3.3 Data analysis: tools and techniques

Primary, the collected data were screened by applying descriptive statistics to assess the presence of outliers and normality of data. Outliers were identified using Cook's distance. A total of 11 responses were detected as outliers because they exceeded the threshold limit of 1 \((\text{Van der Meer et al., 2010})\), consequently deleted from the data set. Moreover, skewness and kurtosis scores of the latent variables were assessed for the norms of normality, and it was found that the values were less than the prescribed threshold \(\text{(i.e. skewness} < 2.0 \text{ and kurtosis} < 9.0)\) \((\text{Schmider et al., 2010})\), which indicated and satisfied the criteria of normal distribution of the data. Because self-reported measures are used to assess the variables, there is a chance of the presence of common method bias (CMB). At the outset, to avoid this, respondents conveyed no precise or correct answer to each manifest and suggested answering the question based on their experience, working knowledge, etc. Secondly, Harman's single test is also applied to the data, which enumerates only 44% of the total variance; this signifies that CMB is absent in the data set.

4. Analysis

4.1 Sample profile

The sample profiles of 283 respondents consist of 68% (192) male and 32% (91) female investors. Regarding age, the majority of the respondents (71%) were between the age group of 30 and 40 years, showing that most of the respondents have gone through technological transitions and have exposure to online transactions. Most of the respondents were highly qualified, 72% of investors were postgraduates and higher and 28% of respondents had graduate qualifications, which confirms a responsible and mature response from the investors. Again, on the basis of respondents' investment engagement, 58% were full-time investors and 42% were part-time investors. Finally, 66% of respondents were comfortable using online platforms, while 44% had reported taking assistance from others.

4.2 Measurement model: validity and reliability of scales

Confirmatory factor analysis (CFA) was used in the first stage of structural equation modelling to extract the information needed to meet the validity and reliability requirements of the measuring scales used in this study. Scale validity was evaluated in two ways:

1. convergent validity, which measures how well variables are connected with each other inside a latent construct; and
2. discriminant validity, which measures how well latent constructs differ from one another.

Before assessing the validity and reliability parameters, the CFA model fit was evaluated. For that, the goodness of fit index \((\text{CMIN/DF} = 1.754, \text{GFI} = 0.889, \text{IFI} = 0.966, \text{TLI} = 0.959, \text{CFI} = 0.965, \text{RMSEA} = 0.052)\) of the model was found to be suitable for assessing constructs’ reliability and validity. The composite reliability (CR) \([\text{greater than} 0.6 \ (\text{Bagozzi and Yi, 1998})]\) and Cronbach’s alpha \([\text{greater than} 0.7 \ (\text{Hair et al., 1998})]\) were used to assess construct reliability or internal consistency. CR ranged from 0.825 to 0.926, and Cronbach's alpha ranged from 0.824 to 0.923, respectively \((\text{Table 1})\), indicating that all constructs were reliable. Discriminant validity was determined by comparing the values of average variance extracted (AVE) and maximum shared variance (MSV). Values of AVE \((0.541 \text{ to} 0.902)\) for all constructs were greater than the values of MSV \((0.020 \text{ to} 0.520)\) for the respective constructs \((\text{Table 1})\), demonstrating good discrimination among constructs. Further, squared values of the AVE of all constructs were greater than the corresponding correlation values \((\text{Table 2})\). Hence, the criteria for discriminant validity assumptions \((\text{Hair} \ et \ al., \ 1998)\) were satisfied.
et al., 2014) were met. Finally, for convergent validity, suggestions of Hair et al. (2016) were followed (AVE should be >0.5 and CR should be >0.07).

The results (Table 1) reveal that the CR of all constructs was more than 0.7, and the AVE of all constructs was greater than 0.5; furthermore, CR was larger than the AVE of all constructs, indicating good convergent validity as well.

### 4.3 Structural model: goodness of fit statistics and path analysis

After meeting the recommended criteria for reliability and validity, the structural model was assessed in the second stage. The goodness of fit statistics was examined by analysing various fit indexes. All the indicators (CMIN/DF = 2.252, GFI = 0.895, IFI = 0.932, TLI = 0.942, CFI = 0.932, RMSEA = 0.58) were found acceptable to conclude a good model fit.

The hypothesised model could explain 57% of the total variance ($R^2 = 0.57$) of ITO (dependent variable) of the individual investors (Figure 2). To analyse online trading intention,
initially, eight paths were drawn in the final model with thirteen hypotheses [eight direct relations (H1 to H8) and three mediating relations (H(Mediation) 1), H(Mediation) 2) and H(Mediation) 3). To examine the mediation effect, bootstrapping method (MacKinnon et al., 2004) was used to see indirect, direct and total effects among the constructs (Table 3). Furthermore, moderating effects of financial literacy were also hypothesised (H(Moderation) 1) and (H(Moderation) 1) to analyse its effect on the relationship between ATT and ITO and PR and ITO. The result shows that the seven direct paths out of eight, before mediation and moderation effect, were found statistically significant in the final model (Table 3 and Figure 2). Five hypotheses
5. Result and discussion

Attitude, which is an important antecedent in predicting an individual’s intention, was investigated using two constructs: PU ($H1: \beta = 0.108, p = 0.017$) and PEOU ($H3: \beta = 0.137, p = 0.048$). Both paths generate significant positive results, indicating a favourable attitude and intention towards online trading behaviour. This demonstrates the significance of the perceived utility of online trading platforms and how investors perceive convenience and ease of use. When they perceive that using technology is simple, easy to learn, easily understood and requires little effort to control (Hartono, 2013), they are more likely to invest online. This result supports the findings of Elkaseh et al. (2016) and Altin Gumussoy et al. (2018).

Because both variables (PU and PEOU) had a significant impact on attitude and attitude had a significant impact on intention ($H4: \beta = 0.512, p = 0.000$), a mediating role of attitude was tested between PU and ITO ($H(Mediation) 1$) and PEOU and ITO ($H(Mediation) 2$) to see if a positive attitude or predisposition towards online trading increases investors’ intentions to invest online, based on their perceptions of its usefulness. The result shows (Table 3) there was a significant improvement in the indirect relationship between PU and ITO when the attitude was present ($\beta = 0.059, p = 0.022$), but there was no significant role of attitude between PEOU and ITO as a mediating variable ($\beta = 0.057, p = 0.067$). This suggests that when investors perceive online platforms for investing as more desirable in the present investment environment, their views (intention) towards such a platform are likely to have a significant impact on their perception of its usefulness. In addition, a positive or negative attitude is not effective in the context of adopting an online trading system when investors are at ease (finding the platform easy to use), they have knowledge and experience about the online facilities required for online trading (Lee, 2009; Martins et al., 2014) but the opposite is true.

$H5$ (SN \(\rightarrow\) ITO), demonstrating the impact of SN that investigate the role of social influences, was found to be insignificant ($\beta = 0.064, p = 0.109$) in predicting investors’ intentions. This shows that investors disapprove of perceived social pressure for using online trading; hence, their intentions to comply with those people's views are not evident in this study. The influence of SN on forming intention has also been found to be weaker than the influence of attitude (Krueger et al., 2000).

<table>
<thead>
<tr>
<th>Hypothesis Path</th>
<th>Coefficient ($\beta$)</th>
<th>Critical ratio (CR)</th>
<th>p-value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H1$ PU $\rightarrow$ ATT</td>
<td>0.108</td>
<td>2.385</td>
<td>0.017**</td>
<td>Accepted</td>
</tr>
<tr>
<td>$H2$ PU $\rightarrow$ ITO</td>
<td>0.198</td>
<td>4.232</td>
<td>0.000***</td>
<td>Accepted</td>
</tr>
<tr>
<td>$H3$ PEOU $\rightarrow$ ATT</td>
<td>0.137</td>
<td>1.977</td>
<td>0.048**</td>
<td>Accepted</td>
</tr>
<tr>
<td>$H4$ ATT $\rightarrow$ ITO</td>
<td>0.512</td>
<td>6.488</td>
<td>0.000***</td>
<td>Accepted</td>
</tr>
<tr>
<td>$H6$ SN $\rightarrow$ ITO</td>
<td>0.064</td>
<td>1.603</td>
<td>0.109ns</td>
<td>Rejected</td>
</tr>
<tr>
<td>$H7$ CSE $\rightarrow$ ITO</td>
<td>0.503</td>
<td>2.072</td>
<td>0.000***</td>
<td>Accepted</td>
</tr>
<tr>
<td>$H8$ PR $\rightarrow$ ITO</td>
<td>0.279</td>
<td>4.530</td>
<td>0.000***</td>
<td>Accepted</td>
</tr>
<tr>
<td>$H(Mediation) 1$: PU-ATT-ITO</td>
<td>0.171</td>
<td>0.230</td>
<td>0.000**</td>
<td>Accepted</td>
</tr>
<tr>
<td>$H(Mediation) 2$: PEOU-ATT-ITO</td>
<td>0.064</td>
<td>0.012</td>
<td>0.109ns</td>
<td>Rejected</td>
</tr>
<tr>
<td>$H(Mediation) 3$: CSE-PR-ITO</td>
<td>0.036</td>
<td>0.042</td>
<td>0.000***</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

Notes: **$p < 0.001$; *$p < 0.05$ **

Source: Authors’ compilation
and other factors in previous studies. In the particular context of online investment decisions, investors perceive risk in using such a platform, negate others’ views (external factors) and mostly rely on their own knowledge and beliefs (internal factors).

CSE shows users’ confidence and efficiency in using it. In this study, CSE is taken in the place of PBC and found to be a significant predictor of perceived risk ($H_{7CSE-PR}: \beta = -0.296, p = 0.000$) and ITO ($H_{6CSE-ITO}: \beta = 0.503, p = 0.000$). The negative relationship between CSE and PR indicates that with more accessible resources (such as computers, the internet and relevant information) and the competence to use them, investors perceive less risk regarding online investing. Similarly, the positive and significant direct relationship between CSE and ITO shows more the control investors have in their behaviour towards using computers more they have a positive intention to trade online. Along with the direct impact of CSE, its indirect impact is also examined by taking a perceived risk as a mediator. The hypothesis ($H_{Mediation 3}$), dealing with the mediating effect of perceived risk between CSE and intention to trade online (CSE-PR-ITO), was also found significant (Table 3). The indirect standardised estimate of this relationship was significant ($\beta = -0.032, p = 0.05$), as was the direct impact ($\beta = 0.518, p = 0.00$), indicating that CSE and ITO are partially mediated by PR. This means that a person’s likelihood of making an investment declines as his/her risk perception increases (Nur Aini and Lutfi, 2019), and the opposite is also true. Even though investors know and have experience with online transactions, this relationship makes it more challenging for them to use internet-based trading systems.

5.1 Moderation of financial literacy

To examine the moderation effect of financial literacy on the relationships between ATT and ITO (please see Figures 3 and 4) and PR and ITO (please see Figures 5 and 6), interaction terms, by taking the Z scores of all the required variables, i.e. ATT, ITO, FL and PR, were computed using SPSS 25.0. Furthermore, AMOS was used to see the overall predictability of interaction effect and presented graphically.

The results of the first moderation analysis ($H_{Moderation 1}$) show that the standardisation effect of the interaction terms “FL_ X_ ATT → ITO” ($\beta = 0.117, p = 0.014$) (Table 3) was positively significant; hence, the proposed effect was established with overall $R^2 = 33\%$ (Figure 3). Similarly the result of moderating effect of FL on the relationship between PR and ITO ($H_{Moderation 2}$) was found significant. The interaction effect, i.e. “FL_ X_ ATT → ITO” ($\beta = 0.117, p = 0.014$) could explain 18\% (please see Figure 5) of total variance of ITO ($R^2 = 0.18$) when financial literacy was included in investors’ intention to trade online.

Figure 3 Interaction analysis (financial literacy and attitude)
It signifies that individuals possess a positive attitude when they assess the credibility and reliability of online brokers and make informed decisions about their investments. In addition, financial literacy can increase an individual's confidence, leading to a reduction in the fear of financial loss and reduced perceived risk in online trading.

6. Conclusion and implication
This study portrays the importance of perceived risk and financial literacy as decisive factors in online investment decision-making. It also shows the predictive power of the confluence of the two most commonly used behavioural models, i.e. TPB and TAM, in this context, which has explained a significant variance ($R^2 = 57\%$) in the intention of investors to trade online. Findings suggest that investors with a positive attitude and the intention to
actively participate in online stock investment are more motivated to do so if they have an understanding of financial concepts. In addition, financial literacy enables individuals to comprehend and manage the risks associated with online investing, therefore lowering their perception of risk and building their confidence in their investment decisions. This study also uses perceived risk as a “mediator” to show how it affects the relationship between CSE and online investor intentions. It has been found that investors’ positive intentions are built on their confidence in knowing and using computers, which is negatively affected when perceived risk is put into the relationship.

Among all the original variables of TPB and TAM models, i.e. attitude, PU, PEOU and CSE (taken as PBC) were found significant predictors of online investment decisions. However, SN were unable to explain the intentions of investors. This demonstrates that when self-expertise (such as knowledge of computers and the internet) is necessary for implantation, individuals disregard the opinions of their peers because they lack confidence in their ability to use it effectively. CSE was found the most significant predictor of intention followed by PU. This again signifies the importance of technical knowledge in online trading, which increases its usefulness and confidence among investors. It is also evident that a positive attitude or predisposition towards online trading increases its PU and ease of use, therefore investors’ intention to trade online.

6.1 Theoretical implication

In this study, it is empirically demonstrated that risk aversion in general for technology and financial literacy level had an impact on risky investment behaviour, especially in the case of online trading behavioural intention. This means that an intention reflecting a view of avoiding taking risks in a technological setting seems to have an influence on our financial behaviour. This is important to the finance literature in terms of the manifestation of the relationship between technology usage and financial risk-taking Intention. This research examines the significance of financial literacy, which is consistent with previous studies on financial behaviour. In addition, the most significant finding of our study is that financial literacy moderates the relationship between investors’ attitudes, perceived risk perception and risky investment intentions. Finally, this study shows the significance of using the TAM

![Graphical presentation of interaction between financial literacy and perceived risk](image)
and the TPB together to provide a comprehensive understanding of the factors that influence an investor’s behaviour in adopting and using technology for online trading. By combining these two models, researchers can analyse both the cognitive and attitudinal factors that impact technology adoption, as well as the individual’s intention to use technology, which is a key predictor of actual usage. Thus, the combination of TAM and TPB could be considered for a more nuanced and complete understanding of technology adoption and usage in risky affairs like investment decisions.

6.2 Managerial implication

This study highlights some important insights about CSE, perceived risk and financial literacy. The significant importance of these factors can be a strategic guide for fund managers and financial service providers. Managers need to pursue risk management approaches using simple online tools that are user-friendly and built to improve their websites’ security and authentications so that fraud and identity theft can be prevented. This might minimise technical risks and build trust among users. The importance of financial literacy is illustrated in this study, which shows that if investors are knowledgeable about financial products and online trading interfaces, they perceive less risk and their attitude changes into an intention to use online trading platforms. In addition to financial services, they should offer financial education through apps or websites as a compliment to the users. SN were found to be an insignificant factor, indicating that in the case of online trading, where high technical efficacy is required, investors were found to be reluctant to follow others’ opinions; however, PEOU and PU were significant predictors of investors' attitudes and cognitive intentions. This should be taken as a positive node, and to increase investors’ dependency on online platforms, they should be made more user-friendly, and an attempt should be made to improve the system by simplifying operational procedures and incorporating new features. This, in effect, will create a positive attitude among online traders.

7. Limitations and scope for future research

One of the obvious limitations of this study is the small sample size which limits the overall predictability of the model. For a better understanding of investors’ intentions towards online trading, the study should be conducted with more responses. Furthermore, the study in different regions or countries should be conducted to increase the external validity of their findings in different cultural settings.

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Further reading


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