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Role of social media on mobile banking adoption among consumers

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ABSTRACT

The purpose of this paper is to examine the effectiveness of social media on the different stages of consumers' cognitive stages through the Hierarchy of Effects (HOE) model for mobile banking adoption among consumers. A two-stage analytical approach with Structural Equation Modeling (SEM) and Neural Network (NN) analysis to bring out social media's distinctive and confirmatory influence on mobile banking consumers. Data from 482 respondents in the age group of 18 years to 30 years (the young consumers) from India was analyzed for social media influence on different cognitive stages of mobile banking acceptance. Results show the increasing tendency of social media influence with increasing cognitive level. Among the four cognitive stages (Attention, Interest, Desire, and Action- AIDA model) of m-banking adoption, Action and Interest stages are the most influenced stages by the social media, followed by Desire and Attention. This research provides a two-stage analytical approach by combining "SEM and NN" to assess the impact of the integration of AIDA constructs. We develop an original integrated model which outlines the phenomenon of the diffusion of information from social media on different cognitive stages of young mobile banking consumers.

1. Introduction

Mobile banking (m-banking), has become an important phenomenon compared to traditional banking. There has been worldwide rapid growth in this area of banking services which was valued at 715.3 million US dollars in 2018 and is expected to reach 1824.7 million US dollars by the year 2026 (Allied Market Research, 2020). Most banks globally have earmarked substantial resources into mobile banking operations. They look forward to reaping its benefits through enhanced customer services (Ciunova-Shuleska et al., 2022; Pal et al., 2021; Alalwan et al., 2017). Experts are of the opinion that revenues and profits will belong to banks that can harness digital technology towards creating better, low-cost services and provide overall value (Giovanis et al., 2019; Alalwan, 2018; Broeders and Khanna, 2015).

The m-banking studies have focused on the adoption behavior over the years (Ciunova-Shuleska et al., al.,2022; Kamdjoug et al., 2021; Zhou et al., 2021; Rabaa'I and ALMaati, 2021; Souiden et al., 2021; Sharma and Sharma, 2019; Shareef et al., 2018; Alalwan et al., 2017, 2016; Oliveira et al., 2014; Hanafizadeh et al., 2014; Teo et al., 2012; Lin, 2011). The m-banking adoption is yet at the progression stage among the users. Banks are using various media platforms to advertise m-banking to capture the untapped customer base of potential mobile banking users. Different media platforms such as print, TV, and internet-based media such as social media are being used for the same. Amongst all other forms of media, social media is widely used for promoting m-banking as it combines the versatility of individual media and mass media (Shankar et al., 2020; Sahoo and Pillai, 2017; Tam and Oliveira, 2017; Tran and Croner, 2016).

Social media's role in effectively influencing the purchase process is well established (Masuda et al., 2022; Nasir et al., 2021; Li and Peng, 2021; Jin and Muqaddam, 2019; Zhang and Benyoucef, 2016; Guesalaga, 2016; Andzulis et al., 2012). More and more products, firms, organizations, groups, industries, policymakers, and society, in general, are using social media to disseminate relevant information implicitly as well as explicitly (Sreejesh et al., 2020). The social media sites like Facebook, WhatsApp, and Twitter are gaining steep popularity especially amongst young people. This shows the impending existence of these technologies in our everyday life. For instance, Facebook reaches to 2.89 billion monthly users by second quarter of the year 2021 (Statista Research Department, 2021).

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Social media provides innumerable opportunities for marketers and makes them learn more about their consumers (Yang et al., 2022; Gozuacik et al., 2021; Plume et al., 2016). Today any branding strategy would be incomplete without considering social media. The use of social media by consumers has positively increased their ability to produce the desired outcomes and also restrict the undesired ones (Cheung et al., 2011; Purohit et al., 2022). This increasing engagement of consumers increases the brand equity and overall consumer loyalty (Khan, 2022; Schaefers et al., 2021; Hafez, 2021; Ebrahim, 2020; Godey et al., 2016).

Most of the researchers on social media's influence on consumer behavior have limited themselves to either comparing the different media sources or assessing overall consumer behavior (Lee and Eastin, 2021; Mogaji et al., 2021; Leong et al., 2021; Al-Abdallah et al., 2021; Radzi et al., 2018; Popp and Wilson, 2018). This paper, however, builds upon the theory of 'Hierarchy of Effects (HOE)' that refers to the hierarchical order in which the consumers first become aware of the product and constantly gain knowledge about it as they develop an interest. Finally, if the positive motivations towards the product are strong enough, they purchase the product (Barry and Howard, 1990).

Mobile phones are a prerequisite form-banking and the most significant users of mobile phones are the young users in the age group of 18–30 years (Barnhart, 2021). They are seen as the potential markets for m-banking services in the developing countries (Purwono et al., 2021). Moreover, young consumers are seen as better equipped to leverage social media (Roberts and David, 2019). Hence, social media has widely been used to influence young consumers towards m-banking adoption (Greenwood et al., 2016; Tran and Corner, 2016; Kim and Ko, 2010). A growing economy like India offers more opportunities for the acceptance and adoption of the mobile banking market primarily due to its younger population and broad reach of social media platforms. India has the second-largest user base of mobile phones worldwide (Global Mobile Market Report, 2020). The mobile phones in India have the highest penetration among young consumers on the line of global age-wise penetration (Statista, 2021).

Therefore, this paper makes four distinctive contributions. Firstly, we analyze the effectiveness of social media on the different stages of a consumer's cognitive process. Secondly, this research provides a new integrated model to assess the impact of the integration of AIDA (Attention, Interest, Desire, and Action) constructs and social media influence for m-banking usage. Thirdly, by focusing on young consumers' cognitive stages, the paper's findings shall increase the organic reach of mobile banking in India. Finally, to measure the social media influence on the cognitive stages of young consumers, a causal research design has been adopted. The two-stage "SEM and NN" analytical approach brings out the distinctive and confirmatory influence of social media on mobile banking consumers. It also adds the reliability in the validation of the results. The research model was first tested by SEM to identify the key predictors of consumer's cognitive stages. The identified predictors were further processed as input layers of NN in order to rank the relative position of the predictors. Thus, the two staged model established the definite effectiveness of social media parameters on the different cognitive stages of m-banking consumers. The two layered statistical approach is also advised to balance the weakness of each other (Sharma and Sharma, 2019; Chong, 2013; Scott and Walczak, 2009).

The paper is organized across seven different sections: Section 2 builds the theoretical framework while the hypotheses developed on the literature are proposed in Section 3. Section 4 offers the research framework which transitions into Section 5 to present the results. Section 6 is dedicated to discussions followed by managerial and theoretical implications along with limitations providing the future research dimensions in this area. The last section (Section 7) concludes the work.

2. Theoretical framework

As proposed by St. Elmo Lewis (1898), the AIDA model has been the first model suggesting the existence of the 'Hierarchy of Effects' (HOE) in marketing communication. AIDA is the acronym for the different cognitive stages of customers' progression as they are motivated towards purchase. These stages are Attention, Interest, Desire, and Action. The initial cognitive stages of awareness and interest are observed when the consumer gains information about the product intentionally or unintentionally. The consumer then feels the desire to make the purchase. The fourth stage, according to Lewis, is a mental state and a consequence of the earlier three stages. In this stage, the consumer decides to either commit or not commit to the purchase. Rossiter et al. (1991) used this concept of consumer's information gathering by placing customers as Low-Involvement and High-Involvement customer.

Advertisers have long been using various advertising techniques to motivate consumers to move through different stages and persuade them into favorable action. A similar argument has been posited by other scholars who followed the AIDA model. Lavidge and Steiner (1961), for instance, argued that advertising is a long-term investment that takes through the customer from the stage of 'being unaware' to finally making the 'actual purchase' in a systematic manner. Each type of media has its pros and cons, thus making it favorable or unfavorable for a particular cognitive stage in the HOE models (Danaher and Dager, 2013; Frambach et al., 2007). Thus, a consumer's informational pursuit is a factor in the preference of a particular media. As the level of information that a specific media carries along with attributes, such as credibility, price, convenience, and risk vary, the choice of media also changes for the consumer. Further, as per the concept of 'media richness', which denotes a medium's ability to convey various information, richer media carry more meaningfulness in consumer's choices (Tseng and Wei, 2020; Daft et al., 1987). This leads to consumers using multiple media (Lin et al., 2013).

When young consumers use content on various social media platforms, they are often indifferent cognitive stages. Social media, like other media, must also have varying influences on different stages of the HOE model. Thereby, in this study, we examine the degree of influence social media has on different cognitive stages of the m-banking consumers and develop a social media-centered marketing communication intervention.

3. Review of literature and hypotheses

There is extensive information on social media's influence on consumer behavior (Purohit et al., 2022). However, we find research gap in this particular domain of research on social media. It has primarily addressed this issue from the marketers' point of view, dwelling on the usage and return on investment. Prior studies have also focused on comparative analysis on the influence of social viz a viz other media. Studies pointing to the process and effectiveness of social media on purchase behavior have been scant. Most studies in this context have approached the subject from an information-processing viewpoint, where social media is observed as a meaningful source of information for the consumer (Suresh and Balaji, 2021; Kim and Lee; 2019). Social media, being part of the internet revolution has aroused interest among modern age marketers about its efficacy in online-purchase behavior.

The review of research was carried out with a two-pronged strategy (J. Paul et.al, 2021). Firstly, we identify the research related to social media's influence on the purchase process of consumers. Secondly, we observe the behavioral determinants of mobile banking users. This strategy should serve the purpose of (a) identifying the gaps in existing research with respect to social media's usage in bringing desired behavioral change (b) ascertaining constructs for defining the level of social media influence in mobile banking acceptance and (c) finding the role of social media in the context of fundamental HOE models.

3.1. Mobile banking and social media

Recent studies have focused on the major influential factors of m-banking adoption by applying various prevalent adoption and diffusion

theories across various domains (Jadil et al., 2021; Sohail and Al-Jabri, 2014; Yu, 2012). The predominant m-banking adoption models such as Technology Acceptance Model (TAM 1 & 2), Unified Theory of Acceptance and Use of Technology (UTAUT 1 & 2), Theory of Planned Behaviour (TPB/DTPB), Theory of Reasoned Action (TRA) and Innovation Diffusion Theory (IDT) have been successfully tested across various geographies and demographics. A few studies have also utilized other theories, such as consumer resistance theory or the task of technology fit (Tran and Corner, 2016). Studies related to social media and mobile banking are scarce and few studies that exist do not approach the issue from a consumer adoption viewpoint. This study therefore, being foremost in this direction, evaluates the effect of social media in terms of its ability to motivate consumers to adopt mobile banking.

3.2. Hierarchy of effects in the context of social media

Hierarchy of Effects has been a well-researched area since its proposition in 1898. Many HOE models have been suggested, and "*the majority of them merely offer changes in nomenclature to the traditional hierarchy of effects model which hypothesizes that audiences respond to messages in a cognitive, affective, and conative (behavioral) sequence*" (Barry and Howard, 1990). Amongst these, Lavidge and Steiner (1961)'s model is worth mentioning. They presented a hierarchical model as a measurement scale for advertising effectiveness. With the new age of social media, new interest in HOE has arisen amongst researchers. Lagrosen (2005) observed that online marketing has been slightly weak in capturing user attention based on AIDA model.

Social media's influence on consumer behavior has been researched by various authors (Voramontri and Klieb, 2019; Heinonen, 2011). However, the researchers have limited themselves either in considering the social media effect from the point of consumer engagement or measuring the implications of social media as a tool for 'Word of Mouth' (E-WOM) (Cheung et al., 2021; Rutter et al., 2021; Chandrasekaran et al., 2021; Sokolova and Kefi, 2020; Giovanis et al., 2019; Hollebeek et al., 2014).

Scant research has been done to assess consumer's response to social media advertising from a behavioral point of view. Hoffman and Novak (2012) have reported that consumption motivation drives consumers to consume social media content in various forms. Continuing on similar lines, Zhang and Mao (2016) proposed a model suggesting that the consumers' online motivation make them click the advertisement on social media, affecting behavioral intentions. Researchers also analyzed the impact of social media activity and user interaction on perception of brands that ultimately influences the purchase (Shareef et al., 2019; Schivinski and Dabrowski, 2016; Hutter et al., 2013). Table 1 synthesizes the extant literature in the context of social media and m-banking adoption:

The AIDA model, though, widely applied for online marketing strategy, its appropriateness for social media is yet to be studied. Hasan et al. (2015), through focus groups, indeed explored the possibility of strategizing social media use for online marketing. Other studies related to AIDA have considered social media for the larger Integrated Marketing Communication (IMC). These studies posit the effects of social media on different stages of the purchase process and propose strategies for successfully including social media in the overall IMC strategy (Laurie and Mortimer, 2019; Valos et al., 2017; Keller, 2016). This study, therefore, aims at abridging this gap by finding the relative utility of social media across the different stages of the AIDA model.

3.3. Constructs and hypotheses

3.3.1. Usage parameters

Social media has an active role in contrast to Television or Radio. To receive social media inputs, the consumers can directly involve with social media as an active audience. With the increased involvement, there is also an increase in the influence of social media on the consumer's involvement in the buying process. Zaichkowsky (1985) explains involvement as "*a person's perceived relevance of the object based on inherent needs, values, and interests*". The increased involvement with social media can be measured with the amount of time, membership of different social networking sites, and overall usage pattern (Sabag and Lehman-Wilzig, 2021; Martinez-Dominguez and Mora-Rivera, 2020). Thereby, we propose the following hypotheses:

H1a: Usage parameters attribute of social media makes the consumers attentive towards mobile banking.

H1b: Usage parameters attribute of social media brings out the interest of consumers towards mobile banking.

H1c: Usage parameters attribute of social media makes consumers desirous to using mobile banking.

H1d: Usage parameters attribute of social media affects the action stage of mobile banking consumers

Table 1
Synthesis Of The Contextual Literature.

S. No	Category	Authors	Summary
1.	Mobile Banking adoption Behaviour	Ciunova-Shuleska et al., al., 2022; Kamdjoug et al., 2021; Zhou et al., 2021; Rabaa'I and ALMaati, 2021; Souiden et al., 2021; Sharma and Sharma, 2019; Shareef et al., 2018; Alalwan et al., 2017, 2016; Oliveira et al., 2014; Hanafizadeh et al., 2014; Teo et al., 2012; Lin, 2011	Authors have focused on the adoption behavior of consumers of mobile banking using Technology Acceptance Model (TAM 1 & 2), Unified Theory of Acceptance and Use of Technology (UTAUT 1 & 2), Theory of Planned Behaviour (TPB/DTPB), Theory of Reasoned Action (TRA) and Innovation Diffusion Theory (IDT).
2.	Social Media and consumer behavior	Masuda et al., 2022; Nasir et al., 2021; Li and Peng, 2021; Jin and Muqaddam, 2019; Zhang and Benyoucef, 2016; Guesalaga, 2016; Andzulis et al., 2012 Sreejesh et al., 2020 Dwivedi et al., 2018, Cheung et al., 2011	Research relates to Social Media's influence of consumer behavior in different geographical areas as well as different behavioural perspective.
3.	Hierarchy of effects models in context of social media	Laurie and Mortimer, 2019; Valos et al., 2017; Keller, 2016; Zhang and Mao (2016), Hasan et al. (2015), Lee and Eastin (2021), Leong et al. (2021).	Studies related to application of Hierarchy of Effects models like AIDA on online marketing and social media

3.3.2. Informativeness

Shankar et al. (2020) showed that the argument quality enhances intention of m-banking adoption and referred argument quality as "*the strength or plausibility of persuasive argumentation*". Similarly, Yadav and Rahman (2017) have outlined informativeness as "*the strength or plausibility of persuasive argumentation*" to be a necessary construct for social media acceptance. Other researchers have identified social media as a strong recommendation agent for information sharing (Nilanshi et al., 2021; Chang and Hwang; 2020; Leonhard et al., 2020). Thus, we hypothesize that:

H2a: Informativeness of social media makes the consumers attentive towards mobile banking.

H2b: Informativeness of social media brings out the interest of consumers towards mobile banking.

H2c: Informativeness of social media makes consumers desirous of using mobile banking.

H2d: Informativeness of social media affects the action stage of mobile banking consumers.

3.3.3. Problem solving

The efficiency of any marketing communication tool is measured by its ability to be a problem solver for the consumer. Social media is considered a problem solver because of its feature of sharing and creating functional knowledge. Problem-solving feature of social media should be able to resolve users' information needs. This construct addresses users' requirement of being updated with the latest trends and assists them in decision-making (Kaur et al., 2018; Hollebeek et al., 2014; Dholakia et al., 2009). The usefulness of information received from social media sites is related to solving functional issues in m-banking. Therefore, we derive next hypotheses as follows:

H3a: Problem solving feature of social media makes the consumers attentive towards mobile banking.

H3b: Problem solving feature of social media brings out the interest of consumers towards mobile banking.

H3c: Problem solving feature of social media makes consumers desirous of using mobile banking.

H3d: Problem solving feature of social media affects the action stage of mobile banking consumers.

3.3.4. Transformational

The outcome expected from any marketing communication is the degree it brings in favorable behavioral changes in the consumer (J. Paul et.al, 2021). Social media is evolving as a strategic tool for the marketers and has grown as an integrated tool of communication for the business as well as consumers. From the viewpoint of the Hierarchy of effects model, behavioral changes should motivate consumers from one stage to the other. Thus, for social media to be an influential media, it must possess transformational qualities. At its core, the social media has completely transformed the way businesses used to operate and provide value to the consumers (Arya, Paul & Sethi, 2022). The literature also suggests a transformational role of social media in terms of impacting the behavior of its users (Nordbrandt, 2021; Creevey et al., 2019). Therefore, the transformation construct would measure the degree of behavioral change brought in due to social media. On this premise, the hypotheses proposed are:

H4a: Transformational characteristics of social media makes the consumers attentive towards mobile banking.

H4b: Transformational characteristics of social media brings out the interest of consumers towards mobile banking.

H4c: Transformational characteristics of social media makes consumers desirous of using mobile banking.

H4d: Transformational characteristics of social media affects the action stage of mobile banking consumers.

4. Research framework

Epistemological considerations based on scientific principles need to be made for rationally justifying the outcomes of any research. A causal research design is adopted to measure the social media influence on young consumers' cognitive stages. Social media influence is considered the cause, and the outcome is manifested in the consumer's cognitive stage. In this causal relationship, social media influence works as the independent variable (IV), while the influence that it exerts on m-banking acceptance is the dependent variable (DV) as depicted in the following Fig. 1:

4.1. Scale development, standardization and data collection

The questionnaire that was developed consisted of three parts to record the responses of the subjects. The first part recorded demographic profile like age, gender, and income. The second section measured the independent variable. The scale had to be built to categorize the cognitive stage in which the respondent existed. The third part had questions about the measurement of social media's influence on the subject and measured the dependent variable.

To identify the general structure and determinants of social media influence (the independent variable) and item generation to ascertain the cognitive stage of the respondent (the dependent variable), a general scale development process as proposed by Churchill (1979) was adopted.

Further, for constructs of the independent variable, validated scales from previous studies were taken. The constructs were modified to suit the context in which measures were to be taken in this study. The influence of social media was measured against four constructs. Each of the four constructs contained itemized statements consistent with the construct. Thus, 16 items in all were used, 4 for each of the constructs. The details of the constructs, along with the calibration of items and source, are being given in Appendix A.

The dependent variable needed to identify the cognitive stage of respondents in the context of mobile banking. We use AIDA model for this purpose in order to assess the possessed cognitive stage at one point of time. Each stage of the AIDA model (i.e., Attention, Interest, Desire,

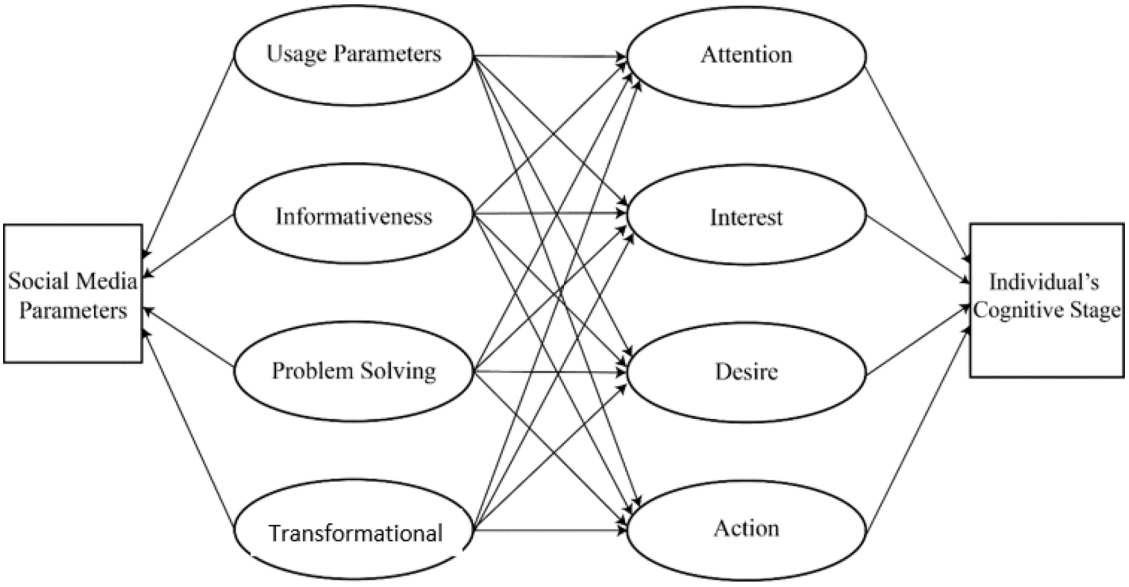

Fig 1. The Theoretical Framework.

and Action) was identified by four statements each, making this section containing 16 statements in all. As per the requirements of the study, the set of statements for each stage had a leading statement (shown in Italics) trailed by the three corroboratory statements. The leading statement was not only able to identify the individual's current cognitive stage but also was able distinguish among other cognitive stages. To elaborate, if the consumer is at the 'attention' stage, he/she will score the highest for the first question i.e., 1(a), and this will be reflected in the scores of the next three statements. Similarly, if he/she is in the desire stage, the statement 3(a) will have high scores. Further cumulative scores should also exhibit a pattern. e.g., a person in desire stage will have high cumulative score of 1(a)+2(a)+3(a)+4(a) compared to a person in 2nd stage i.e., 1(a)+2(a)+3(a)+4(a). The details of the cognitive stage and its measurement indicators are shown in Appendix B.

To check the scale's internal consistency, a small pilot study was administered with 30 post-graduate students who were already using mobile banking and were well conversant with social media. Each of the students was asked to check the appropriateness and unambiguity of the items. The objective of this was to test the face validity (Hardesty and Bearden, 2004). Moreover, some constructs such as usage (involvement), informativeness, and problem solving (functional benefits) taken from existing literature established strong content validity.

For the measurement of the independent and dependent variables, an appropriate tool in the form of a questionnaire was designed and standardized. The next stage of administering the standardized scale to respondents had to be done such that the measures recorded were representative of the larger population. The results, thus produced would help in generalizing, leading to theory building. Thereby, an appropriate sampling plan was made to administer the questionnaire using a digital form created on Google forms as the study was shared during the Covid-19 pandemic period. The respondents were reached out through various social media platforms. A brief of the study was shared and members in the social media group were invited to be respondents. Interested members were asked to share their e-mails. The respondents received a link to the form in their e-mails with a covering letter stating the study's general purpose and a request to forward this e-mail to their friends. This was purposefully done to encourage snowball type of sampling and thus induce a degree of randomness in the sampling plan.

Further, this type of sampling increases the chance of identifying the requisite characteristics in the population with low sampling variance and cost (Malhotra and Dash, 2016). In a span of 60 days, 482 complete responses were received after discarding 29 incomplete responses. In the third and final stage, collected data was decrypted, edited for anomalies, and analyzed after that.

4.2. Structural equation modelling and the neural network model

The NN model has been a preferred method among researchers for a few years due to its advantage over traditional statistical methods. It also has a distinctive ability of dealing with the non-compensatory decision processes as well the ones that do not meet the assumption of linearity (Chan and Chong, 2012). The traditional multivariate statistical methods commonly used to predict consumer behavior may not always be reliable as they end up oversimplifying the complex decision-making even for the linear compensatory models (Sharma, 2017; Chong,2013; Chan and Chong, 2012). Moreover, the researchers have argued that the method of evaluation may also be non-compensatory given very few alternatives available to consumers (Sharma, 2017; Chiang et al., 2006; Johnson et al., 1989). Pertaining to m-banking, the consumers may be more concerned with informativeness that may not be compensated by usage parameters. Thus, the cases involving non-compensatory decision process may require more reliable methods such as neural network as it provides higher prediction accuracy (Sim et al., 2014; Chiang et al., 2006). On these lines, the neural network has been used to assess the predictability of the suggested model. However, NN may not always be appropriate for testing of hypotheses and examining the relationship owing to its 'black-box' nature. This study, therefore, adopts a two-staged analytical technique by integrating "SEM and NN" on the path of previous other researchers (Sharma and Sharma, 2019; Liebana-Cabanillas et al., 2017; Tan et al., 2014; Chong, 2013; Leong et al., 2013). Thus, SEM helps in identifying the significant predictors (Dash and Paul, 2021) whereas NN is used to rank the identified predictors and also validate the results.

5. Data analysis and the results

The survey instrument was put to testing in four significant steps. Descriptive analysis was initially run to understand the spread of respondents as summarized in Table 2. The study received responses from 57.5% females and 42.5% males. Since the survey emphasized on the respondents as young consumers, the study concentrated on the spread of age group from 18 to 30 years, consisting of 23% from 18 to 23 years age group, 53.5% and 23.4% from 24 to 29 years and 30–35 years age group respectively. Most of the respondents were well educated, with 93.8% possessing a graduation degree and above.

5.1. Reliability and validity analysis

The statistical software packages, SPSS 23 and AMOS 18 were used for the data analysis (Dash and Paul, 2021). The Cronbach alpha values of survey items were observed as: Usage Parameters:0.898, Informativeness:0.845, Problem Solving:0.869, Transformational:0.873, Attention:0.839, Interest:886, Desire:843 and Action:0.922. The Cronbach alpha values (>0.70) affirmed the internal consistency of the constructs as advised by Hair et al. (2010). The goodness of fit measures thus obtained are as follows: GFI=0.928, AGFI=0.911, comparative goodness of fit index (CFI)=0.961, TLI=0.942, IFI= 0.933and RMSEA =0.053. All the fit indices being more than 0.90 (Hair et al., 2010) and the RMSEA less than 0.07 (Steiger, 2007), it is believed that the proposed model provides good fit to the data.

The data analysis further proceeded to assess the internal consistency with composite reliability (CR) and construct validity via assessing the convergent as well as discriminant validity. Since all CR values of the items are more than 0.870, the instrument further confirms the internal consistency of items as also supported with Cronbach alpha. Further, it was observed that all the AVE values are more than 0.50 and also less than CR respectively, confirming convergent validity of the instrument. The instrument further confirmed the discriminant validity as well by having the ASV and MSV values less than AVE (See Table 3).

5.2. Hypotheses testing of the constructs

After the satisfactory measurement model testing, the third step was

Table 2
Sample Construction.

Demographic variable	Categories	No. of respondents	Percentage
Gender	Female	277	57.5
	Female	205	42.5
Age	18–21 years	111	23.0
	22–25 years	258	53.5
	26–30 years	113	23.4
Family income (monthly)	<50,000 INR	89	18.5
	50,000–1,00,000 INR	167	34.6
	>1,00,000 INR	226	46.9
Education	School education	5	1.0
	Intermediate	25	5.2
	Graduation and above	452	93.8

Table 3
Reliability and Validity of the constructs.

	CR	AVE	MSV	ASV	UP	INF	PS	TRANS	ATT	INT	DES	ACT
UP	0.913	0.776	0.298	0.169	0.881							
INF	0.878	0.823	0.146	0.071	0.489	0.907						
PS	0.901	0.787	0.194	0.052	0.455	0.864	0.887					
TRANS	0.906	0.785	0.135	0.052	0.393	0.783	0.878	0.886				
ATT	0.872	0.684	0.233	0.174	0.337	0.185	0.071	0.066	0.827			
INT	0.888	0.823	0.305	0.197	0.573	0.58	0.527	0.516	0.801	0.907		
DES	0.876	0.762	0.285	0.189	0.537	0.461	0.447	0.493	0.746	0.805	0.873	
ACT	0.918	0.778	0.415	0.163	0.45	0.299	0.411	0.419	0.729	0.878	0.851	0.882

thereby taken upon to further examine the structural model via testing of hypotheses. The beta values were calculated for the hypothesized paths at a significance level of 0.05 to test the proposed hypotheses.

Four dependent variables (attention, intention, desire and action) thus formed four individual hypotheses. The independent variables are usage parameters, informativeness, and problem solving and transformational. As observed through Table 4, H1a is not rejected while H1b, H1c and H1d are rejected, indicating that usage parameters of social media attract the attention towards mobile banking usage. Further, H2a, H2b and H2d are not rejected while rejecting H2d, indicating that usage parameters, problem solving and transformational aspects of social media bring out the interest towards mobile banking adoption amongst the users. For the hypotheses H3, H3a and H3dare not rejected while rejecting H3b and H3c, indicating that usage parameters and transformational characteristics of social media make mobile banking users desirous of its adoption. Lastly, for the hypotheses H4, none of the hypotheses out of H4a, H4b, H4c and H4dis rejected, strongly indicating that the usage parameters, informativeness, problem solving and transformational features of social media entice the action stage of mobile banking adoption amongst the consumers.

Again, the values of R^2 extracted from the four dependent variables namely Attention, Interest, Desire and Action were59%, 69%, 62% and 73% respectively. Thus, the study indicates that usage parameters, informativeness, problem solving and transformational parameters of social media have a very significant role in various cognitive stages of mobile banking adoption amongst the potential users.

Table 4
Hypothesis Testing Outcomes.

Hypothesis		Estimate	S.E.	p-value	Result
H1a	Usage parameters→Attention	0.441	0.087	***	Supported
H1b	Informativeness→Attention	0.107	0.07	0.125	Not supported
H1c	Problem solving→Attention	0.093	0.063	0.143	Not supported
H1d	Transformational→Attention	0.156	0.115	0.176	Not supported
H2a	Usage parameters→Interest	0.152	0.044	***	Supported
H2b	Informativeness→Interest	0.079	0.027	0.004	Supported
H2c	Problem solving→Interest	0.021	0.017	0.211	Not supported
H2d	Transformational→Interest	0.085	0.037	0.021	Supported
H3a	Usage parameters→Desire	0.343	0.057	***	Supported
H3b	Informativeness→Desire	0.017	0.038	0.655	Not supported
H3c	Problem solving→Desire	0.079	0.043	0.066	Not supported
H3d	Transformational→Desire	0.30	0.076	***	Supported
H4a	Usage parameters→Action	0.461	0.068	***	Supported
H4b	Informativeness→Action	0.156	0.051	0.002	Supported
H4c	Problem solving→Action	0.127	0.054	0.019	Supported
H4d	Transformational→Action	0.428	0.098	***	Supported

5.3. Neural network model results

The fourth and final step of the analysis was conducted via neural network modeling. The study used the widely used feedback propagation multilayer perception (MLP) method (Sharma and Sharma, 2019; Sharma, 2017; Liebana-Cabanillas et al., 2017; Chong et al., 2015; Negnevitsky, 2011). The NN model presents the four sub-models (Fig 2). Model A has four input layers represented by factors, namely usage parameters, informativeness, problem solving, and transformational, and the output layer is represented by attention. Next, model B also has the same four input layers representing independent variables and interest as the output layer. Model C presents the same input layers, and desire presents the output layer. Finally, model D takes action as the output layer with the four independent variables as the input layer. We performed the ten-fold cross-validation by taking90% data as training data and 10% as testing data to avoid overfitting (Sharma and Sharma, 2019; Sharma, 2017; Chong et al., 2015).

The average RMSE values of all the four NN models have been observed to be relatively small (0.0956, 0.0944, 0.0741, and 0.0744 for training data; 0.0791, 0.0706, 0.0777, and 0.0738 for testing data) indicating a good prediction accuracy level of the dependent variable depicting the cognitive stages of the users in the adoption of mobile banking (as presented in the Table 5).

As presented in Table 6, in NN model A of attention, usage parameter is the most imperative predictor of satisfaction and then trailed by transformational, problem solving, and informativeness. Whereas, in the model B, the informativeness feature of social media is the main predictor of interest towards mobile banking adoption trailed by problem solving, transformational, and usage parameters, respectively. Next, in NN model C, the most imperative predictor of desire to use mobile banking through social media is usage parameters trailed by transformational, informativeness, and problem solving in that order. Finally, in the model D, the main predictor of mobile banking adoption in the action stage is usage parameters trailed by transformational, problem solving, and informativeness.

A noteworthy outcome is that social media's usage parameters feature significantly influences all prospective mobile banking users' cognitive stages. The second most important feature of social media in influencing mobile banking users' various cognitive stages is the transformational feature. The third feature in terms of importance is informativeness; however, the problem- solving feature carries the least importance as identified by the neural network model. The SEM results also predicted the usage parameters to be the most important predictor and other features too, in terms of their relative importance are identical to NN results.

Thus, NN model results supported the results of SEM modeling. This similarity in the outcomes signs towards the validity of the results. This further enhances the model's suitability in identifying the considerable role of social media towards mobile banking adoption.

6. Discussion

The outcome of this study has clearly brought out useful results in the context of social media. As can be observed from the results above, the

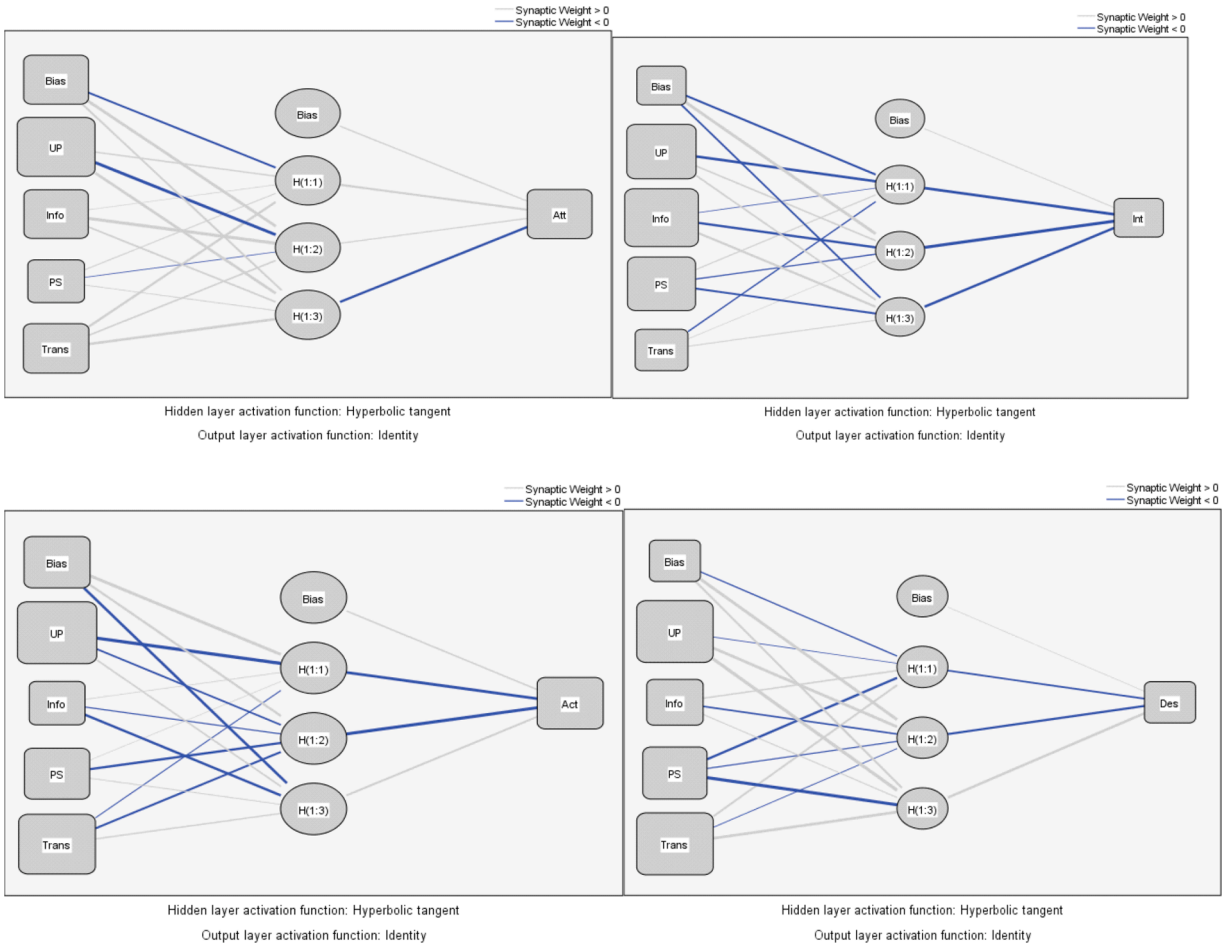

Fig 2. Neural network models.

Table 5
RMSE NN Modeling.

Network	Model A		Model B		Model C		Model D	
	Training	Testing	Training	Testing	Training	Testing	Training	Testing
ANN10	0.0971	0.1015	0.0748	0.0755	0.0719	0.0582	0.0813	0.0647
ANN10	0.0936	0.0838	0.0758	0.0764	0.0817	0.0702	0.0706	0.0783
ANN10	0.0933	0.096	0.072	0.0744	0.0835	0.0849	0.0803	0.0772
ANN10	0.0992	0.1016	0.0721	0.0652	0.0813	0.067	0.0731	0.0704
ANN10	0.0914	0.0879	0.0739	0.0708	0.0748	0.0749	0.081	0.0695
ANN10	0.0952	0.094	0.0724	0.0944	0.0831	0.0787	0.0752	0.0567
ANN10	0.0966	0.09	0.0729	0.0634	0.0797	0.0662	0.0843	0.0763
ANN10	0.0987	0.0981	0.0785	0.0834	0.0822	0.0648	0.0708	0.0874
ANN10	0.0944	0.0899	0.0759	0.0628	0.071	0.0756	0.0782	0.0869
ANN10	0.0968	0.101	0.0724	0.0736	0.0818	0.0656	0.0819	0.0706
Average	0.0956	0.0944	0.0741	0.0740	0.0791	0.0706	0.0777	0.0738
S.D.	0.0025	0.0060	0.0022	0.0097	0.0047	0.0079	0.0049	0.0095

proposed research model was able to achieve the satisfactory level of accuracy in the predictive power of the AIDA model constructs. Results of the reliability and validity further indicate the robustness of the constructs.

The results underpin the significant relationship between the information quality of social media and users' cognitive stage towards the usage of mobile baking. Table 3 clearly depicts that as consumers increase usage, informative benefits, and functional benefits, the relationship with each cognitive stage also grows, i.e., for the Attention stage, only usage is significant, for interest stage usage and informative benefits are significant, and so forth. The information quality provided by the marketers here can be judged by the informativeness and the functional benefits that consumers gain through social media interactions. Thus, this study strengthens the concept that as the information quality of social media enhances; the consumer's transition from one stage of cognition to the other also increases. This enabling role of social media is also observed by many researchers in earlier studies (Voramontri and Klieb, 2019; Kaur et al., 2018; Sahoo and Pillai, 2017; Duffet, 2015; Powers et al., 2012). They all have reiterated the informational role that social media plays in marketing communication campaigns.

The results of the study show another interesting aspect related to social media. The NN results show the hidden layer activation function to be highest in the Interest and the Action stages. This implies that in

Table 6
Importance of the Independent Variables.

Network	Model A: Attention				Model B: Interest				Model C: Desire				Model D: Action			
	UP	Info	PS	Trans	UP	Info	PS	Trans	UP	Info	PS	Trans	UP	Info	PS	Trans
ANN1	0.421	0.312	0.127	0.141	0.248	0.239	0.258	0.254	0.349	0.233	0.207	0.211	0.427	0.05	0.315	0.208
ANN2	0.419	0.093	0.253	0.236	0.283	0.216	0.254	0.248	0.478	0.118	0.07	0.335	0.286	0.28	0.282	0.153
ANN3	0.379	0.113	0.234	0.275	0.256	0.32	0.276	0.148	0.311	0.268	0.27	0.152	0.456	0.122	0.221	0.202
ANN4	0.102	0.336	0.172	0.391	0.27	0.297	0.263	0.17	0.327	0.314	0.069	0.29	0.317	0.224	0.304	0.154
ANN5	0.325	0.172	0.173	0.33	0.267	0.272	0.159	0.302	0.441	0.215	0.157	0.188	0.403	0.044	0.19	0.363
ANN6	0.47	0.097	0.059	0.374	0.352	0.278	0.264	0.105	0.331	0.088	0.323	0.259	0.296	0.272	0.252	0.18
ANN7	0.495	0.184	0.069	0.253	0.292	0.221	0.289	0.198	0.531	0.283	0.048	0.132	0.336	0.032	0.041	0.591
ANN8	0.389	0.083	0.353	0.175	0.192	0.157	0.283	0.369	0.509	0.177	0.122	0.192	0.304	0.205	0.299	0.192
ANN9	0.457	0.221	0.084	0.238	0.243	0.248	0.21	0.369	0.297	0.18	0.226	0.297	0.354	0.218	0.197	0.231
ANN10	0.61	0.093	0.131	0.165	0.301	0.278	0.253	0.168	0.415	0.048	0.161	0.376	0.387	0.043	0.204	0.366
Avg Imp	0.407	0.17	0.166	0.258	0.27	0.253	0.251	0.233	0.399	0.192	0.165	0.243	0.357	0.149	0.231	0.264
Nor Imp	92.42	40.67	40.55	61.74	88.89	83.12	82.18	74.33	99.97	50.87	46.24	64.2	95.68	45.56	66.25	66.93

the case of mobile banking adoption, the consumer behavior exhibited is more logic-driven than emotion-driven. Hence, social media influence on the adoption of mobile services is more effective in stages of interest and action, which has the greatest informational need amongst all other stages.

The NN models A, B, C, and D also exhibits another noteworthy study outcome. Amongst the four models formulated, all models except B have usage parameters as the most important predictor for the four cognitive stages. It implies that as the consumers' online activity increases, their likeliness for mobile banking adoption also increases. A possible explanation may be that, with the increased usage of social media, the consumers' exposure to favorable information and marketing stimuli towards mobile banking also increases. Thus, a consumer at any cognitive stage will have an enhanced motivation for mobile adoption if his/her social media usage increases. This also may justify the higher rate of mobile banking adoption amongst young consumers as they have higher social media penetration. The outcomes of the neural network models have also been corroborated in the SEM modeling results.

The study brings to light the relative importance of information in each of the cognitive stages. We can observe that the beta values of the constructs making up the independent variable (usage pattern, informativeness, problem solving, and transformational) become increasingly significant with each of the four dependent variables (attention, intention, desire, and action). This is consistent with prior studies (Lavidge and Steiner, 1961) on the conation stages of hierarchy. This implies that, as the consumer travels through the different cognitive stages, his or her informational requirements also change. So, after the consumer is attracted to an attractive discount or offer, he/she would like to know more about the service being offered. The ability of social media in the initial stages of AIDA may be the same as that of other media like TV or print, but as the consumer starts getting more and more involved, his/her informational needs suddenly rise, thus giving a distinct advantage to social media which is information intensive.

6.1. Theoretical implications

This study contributes appropriately for researchers exploring social media influence on the behavioral acceptance pattern in the specific context of mobile banking services in developing countries.

Firstly, this research appends to the social media influence literature in reference to a high involvement contemporary service of mobile banking, thus expanding the horizon of social media. There have been various studies on social media influence on buying behavior, usage behavior, continued usage of various technologies; however, there is no such study that focuses on the cognitive stages of the users. Although the study is pivoted on a well-researched and accepted marketing communication model, the context of mobile banking and the insights revealed through this work will surely add to the richness of the existing theory.

Secondly, this research provides a new model to evaluate the impact of integration of AIDA constructs and social media influence for mobile banking usage in a developing country like India. This study describes the diffusion of information to consumers at different stages in the HOE model. Thus, this research by building upon the theory of Lavidge and Steiner (1961), provides the reasonable explanation for the movement of consumers from one stage to the other in hierarchy of effect.

A significant result that has come out of this work is the relative efficiency of social media advertising campaigns in influencing the consumer behavior across different stages. This study has revealed that the transformational capabilities of social media are high. Therefore, the impetus required in the final stage (the 'Action' stage) of the AIDA model, can most efficiently be delivered by social media. As the study was conducted in the mobile banking domain, a high-involvement consumer decision, social media's ability to be highly transformational in high-involvement consumer decisions is noteworthy.

Another interesting finding in this study has been that; as social media usage increases, the efficiency increases with advancement in the consumer decision hierarchy. Results of the NN models strongly suggest that as the consumer moves from the attention stage to the final action stage, the strength of relationships in each phase increases.

6.2. Managerial implications

The study also provides suitable practical implications for the marketing media of mobile service providers and policymakers. The study has mainly focused on young consumers who are the most significant social media users and constitute the largest consumer segment in the m-commerce space. Therefore, the theory on mobile banking acceptance would be helpful in the expansion of the digitalization of the Indian economy.

As the consumer increases usage of informative benefits and functional benefits of social media, the relationship with each cognitive stage also increases. This finding hints towards two implications. Firstly, the young consumers prefer social media as a very important source for information and knowledge. Secondly, as the consumer moves towards the decision stage of m-banking acceptance, the requirement for relevant information and knowledge increases. This, in turn, pushes the consumer to the next stage of HOE. Financial institutions and digital payment services providers should develop strategies to provide more information and knowledge-intensive marketing communication to increase the acceptance rate in mobile banking. Social media, with its versatility and ability to be personalized, can efficiently deliver user-specific content. Therefore, mobile banking campaigns should be encouraged to use social media as a tool focusing on consumers who are at the later stages of decision making.

Advertising returns, in this case, would be higher in comparison to consumers who are at the early stages. Intelligent social media platforms that can successfully harness digital technology such as Artificial Intelligence (AI) can strengthen media efforts in this direction. Thus, marketers can leverage social media and greatly reduce marketing costs. The reach of social media is expanding at a fast pace, banks can easily bring

in customer awareness about new services and product offerings through this media.

In addition, the results indicate a strong relationship between usage patterns and AIDA stages, implying that high social media users will always be more influenced towards mobile banking acceptance. Considering this, marketing practitioners can offer an exclusive social media platform for furthering mobile banking penetration. Off late many banks and financial institutions have started offering mobile apps with personalized chat options. By measuring potential consumers' attitudes toward m-banking services and their beliefs regarding the usage and informational aspect of social media for the same, the variability in m-banking acceptance can be explained significantly.

The varying informational requirements of consumers in different stages can have meaningful imitations in a marketing strategy context. At each stage, the information that is to be communicated varies. Thus, the way it is encrypted must also change. Initially, the consumers might be interested in benefits accruing out of mobile banking use. But those at later stages, will need information related to troubleshooting or using advanced mobile banking features.

The study shows that consumers' involvement in social media has been a crucial determinant in m-banking acceptance. As mentioned earlier, with increased involvement usage, information and knowledge gathering from social media also increases. Marketers seeking to promote mobile banking through social media should also look at ways and means to increase the involvement of potential consumers. Posting customized content and running contests and giveaways are some popular strategies for involving consumers on social media.

Social Media is a vibrant place for sharing and exchanging ideas and feedbacks. Engaging consumers on Social media for mobile banking operations can also increase new avenues for banks in terms of crowdsourcing ideas, new lead generation, real-time customer service etc. Promoting mobile banking on social media platforms can also bring in cross-selling opportunities.

6.3. Limitations and directions for future studies

This study despite providing various impactful and actionable insights into social media influence on mobile banking in a developing country is delimited by some limitations. The limitations are broadly because of two reasons. The first reason arises due to methodological constarints while the other is due to subjective constraints arising due to the context of the study.

Two major limitations due to methodological constraints can be identified. Firstly, the small sample size of 482 consumers may not be recommended for the generalization on a vast population. It is recommended to validate the proposed model with a larger sample size for future research. Secondly, this study did not provide insights related to different demographic characteristics of the consumers. This shortcoming paves the way towards multi-group analysis based on such demographics. Future studies may also provide deeper understanding of m-banking adoption in other age groups to help segment the population for targeted advertising. Longitudinal studies to understand variability in consumer behavior towards m-banking in the context of developing countries are also recommended.

Subjective constraints give rise to applicability of AIDA model. Social media effect can also be studied with cognitive, affective and conative stages of consumers. This will strengthen the theory of social media research on behavioral usage pattern. Ethnographic study is also recommended to understand the deterministic role of social media in the evolution of millennial consumers.

An interesting direction that the study points to is the use of social media for customers who have already adopted mobile banking. The study shows how social media can influence customers at different stages of m-banking adoption. Further research can be done in understanding the role of social media on people who are current mobile banking customers. This can be an important area for future studies as more and more people join mobile banking services, researches that study customer expectations, new opportunities in terms of additional services and informational requirements will be required.

COVID 19 has resulted in structural changes in many areas of life and business (Gordon-Wilson, 2021; Yap et al., 2021; Rayburn et al., 2021: Kursan Milakovic, 2021; Nayal et al., 2021; J. Paul and Bhukya, 2021; Sharma et al., 2021; Chopdar et al., 2022). For example, social media and mobile apps have become part of people's life in many sectors including healthcare, food delivery etc. (Arya et al., 2021; Chakraborty and Paul, 2022; Purohit et al., 2022; Chopdar et al., 2022). As an outcome, following prior calls (J. Paul and Bhukya, 2021; Paul & Mas, 2020) we concur with the need for need new theories, methods and paradigms to carry research studies in the post-pandemic era to analyze the new processes, patterns and problems arising out of the problems of the Pandemic.

7. Conclusion

Mobile banking is the 'new age transaction' mechanism that promises to take on the global economy. Banks that fail to adapt to this new technology will find it hard to survive in modern times. This study reveals that social media is a highly influencing medium in m-banking adoption for young consumers. The adoption of m-banking services is similar to purchase decision stages, and consumers of m-banking also pass-through different stages before finally going in for adoption of m-banking services. It being a high involvement decision making, the information required in m-banking adoption hierarchically increases.

Results show the increasing tendency of social media influence with increasing cognitive level. Among the four cognitive stages (Attention, Interest, Desire, and Action- AIDA model) of m-banking adoption, Action and Interest stages are the most influenced stages by the social media, followed by Desire and Attention.

The efficiency of social media increases with the consumers' transition in different cognitive stages of m-banking adoption. Neural Network analysis has shown that among the four cognitive stages of m-banking adoption (AIDA model), social media's interest and action stages are the most influenced ones. This study also gives an important contribution by explaining the transition of consumers in m-banking adoption. It also suggests a direction for managerial action towards the propagation and promotion of m-banking services amongst young consumers who are the most significant and most frequent social media users and are also forthcoming towards new technologies.

Declaration of Competing Interest

Authors Manisha Sharma, Subhojit Banerjee and Justin Paul have no conflict of interest.

Appendix A: Summary of Constructs used in the Independent Variable

Construct	Construct Definition	Items	Calibration	Source
Usage Parameters	Time and mode of using different social media sites representing involvement with social media.	(a)I am using at least one of the social media platforms like WhatsApp, Facebook, twitter, tinder etc. (b) I check these sites/app more than 4 times a day for messages and videos. (c) I mostly check these sites on my mobile phone. (d)I often accept communication and messages that come to me from product manufacturers/ service providers.	Likert's 5-point scale	Zaichkowsky (1985)
Informativeness (Argument quality)	The degree to which e-commerce social media offers accurate, useful, and comprehensive information. Also, in the eWOM context, argument quality refers to "the strength or plausibility of persuasive argumentation".	(a)social media offers accurate & useful information on products. (b) I use social media to learn about new products and technologies. (c) The information provided by e-commerce's social media is comprehensive. (d) I sometimes read/watch materials on the social sites that are not sent by my friends (sponsored).	Likert's 5-point scale	Yadav and Rahman (2017); Shankar et al. (2020)
Problem Solving (Functional Benefits)	Usefulness of information received from social media sites related to solving functional issues in MB.	(a)I use social media for getting solutions to my problems and issues related to products and services. (b)I often use social media to watch demonstration videos to fix and build things. (c)In my social media groups, I seek advice before making a big purchase decision like buying a car, house, loan etc. (d)I use social media to report my dissatisfaction, if any, related to a product or service.	Likert's 5-point scale	Dholakia et.al. (2009)
Transformational	The behavioral change brought in by social media	(a)I have tried new products and services after learning about them through the social media. (b)I get interested in products and services which my social media friends approve of. (c)I accept the advices that I get on social media because these are from real users. (d)social media always informs me about the latest trends & technology.	Likert's 5-point scale	Self-Generated

Appendix B: Summary of Constructs used to identify Cognitive Stage

Cognitive Stage	Inventory Items	Calibration
Attention	*(a)I have heard about mobile banking, but never tried it myself.* (b)People can steal my money through Mobile banking. (c)My friend and family use mobile banking and seem happy using it. (d)Mobile Banking is available in selected banks	Likert's 5-point scale
Interest	*(a)I would like to know more about mobile banking, especially its advantages.* (b)Mobile Banking is a new and convenient way for Banking (c)I have heard that Mobile Banking Saves money on transactions (d)Mobile banking is safe to use	Likert's 5-point scale
Desire	*(a) I often feel that I should also start to use mobile banking.* (b)Mobile Banking is handy for people who are travelling. (c)I sometimes read and gather information related to mobile banking use. (d)Mobile banking can help in paying bills of electricity, house tax, phone, gas etc. easily	Likert's 5-point scale
Action	*(a) I have been using mobile banking since some time.* (b)I have never lost money due to mobile banking. (c) I use Mobile banking mostly to pay bills like electricity, phone, gas etc. which would otherwise take too much time. (d)I look out for cashback schemes in mobile banking.	Likert's 5-point scale

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