International Journal of Financial, Accounting, and Management (IJFAM)
ISSN: 2656-3355, Vol 4, No 4, 2023, 427-447 https://doi.org/10.35912/ijfam.v4i4.1276

Impact of SMS advertising on purchase intention for young consumers

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Article History
Received on 27 October 2022
1st Revision on 28 October 2022
2nd Revision on 7 November 2022
3rd Revision on 9 November 2022
Accepted on 16 November 2022

Abstract

Purpose: It has been discovered that SMS advertising perception has a considerable direct or indirect impact on customer purchase intention. Based on the stimulus-organism-response (SOR) framework, this study focuses on providing an empirically supported response to this specific topic in the context of Bangladeshi university students after the COVID pandemic era.

Research methodology: The study employed a two-stage hybrid approach using structural equation modeling and artificial neural network modeling to assess and validate the findings. The study used convenience sampling and a structured questionnaire to gather data from undergraduate students.

Results: The results indicate that SMS advertising perception significantly influences purchasing intention. Attitude toward SMS advertisement and advertising value also mediate the relationship.

Limitations: The research is limited to the Dhaka metropolitan area in Bangladesh, and customer experience may differ in other places. Future studies should concentrate on different geographic regions to explore the topic more. Only young customers were considered in this study; outcomes for other consumers may differ.

Contribution: The study serves to broaden the area of research on SMS advertising perception and its impact on purchase intention in Bangladesh. Additionally, it helps marketers by encouraging better decision-making when developing successful marketing campaigns employing mobile-based SMS service advertisements after the pandemic epoch.

Novelty: It also allows experimental data to validate the SOR framework in the context of young consumers by applying partial least squares and artificial neural network techniques.

Keywords: *SMS advertising perception, advertising value, purchase intention, PLS-SEM, Artificial neural network*

How to Cite: Roy, S. K. (2023). Impact of SMS advertising on purchase intention for young consumers. *International Journal of Financial, Accounting, and Management*, 4(4), 427-447.

1. Introduction

Globally, the use of mobile communication technology and portable devices has risen dramatically in recent years (A. Sharma, Dwivedi, Arya, & Siddiqui, 2021). This breakthrough has provided marketers with new ways to approach their consumers. Along with accelerating progress, these technologies give advertisers customizable benefits such as consumer preferences, taste patterns, focused customer base and options, identifying future clients, and so on. Because of its distinctive characteristics and rapid diffusion percentage (Tsang, Ho, & Liang, 2004), mobile communications (MC) have been a fantastic alternative for advertisers and marketers to offer products and services to diverse customer categories (Y. Wang & Genç, 2019). The short message service (SMS) is a text-oriented MC tool and a widely used and profitable method of transmitting information from one individual to another (A. Sharma et al., 2021). It is an essential medium for sharing value-added facilities with clients (A. Sharma et al., 2021). Although online network communication is increasing daily, SMS has emerged as a dedicated channel for communicating with actual and identifiable consumers (A. Sharma et al., 2021). For

targeting certain market groups, particularly young consumers (Laurie, Mortimer, & Beard, 2019), with highly tailored, relevant, timely, and rapid marketing messages, SMS is a superior advertising method (Drossos, Giaglis, Vlachos, Zamani, & Lekakos, 2013). SMS advertising is frequently favored over other mobile promotional methods due to its ease of use and lower technology reliance (M. R. Khan, Roy, & Hossain, 2019; Lin & Chen, 2015; A. Sharma et al., 2021).

SMS advertising (SA) is a method of driving promotion by the advertiser rather than the consumer (Rau, Zhang, Shang, & Zhou, 2011) and helps in disseminating information (Anoke, Ngozi, Uchechukwu, & Joyce, 2022; Tsang et al., 2004). More than 90% of incoming SMSs are checked within a relatively small window of time of 15 minutes after sending, which implies the relevance of SA in the current environment (Bakr, Tolba, & Meshreki, 2019). Additionally, compared to e-mail marketing (Aydin & Karamehmet, 2017), SA has far more significant response rates (Essany, 2014). The rate of text completion for SMS messages is likewise relatively high. Again, about 98% of the SMSs are read by receivers before the end of the day. And 90% are within 3 minutes of delivery (A. Sharma et al., 2021).

With regard to one-to-one sharing of information, these reasons and facts imply that SMSs remain the preferred option. Due to these advantages, SA is among the most efficient approaches for companies to connect with current and potential customers (Bamoriya & Singh, 2012; Rahman & Shanjabin, 2022). Again, due to characteristics like reachability, portability, and widespread use of mobile or cell phones, SMSs stand out and are striking to advertising organizations. As a result, even in the smartphone era, marketing businesses prioritize SA as part of their cross-media advertisement campaign.

The theory behind the Stimulus-Organism-Response framework (SOR) (Mehrabian & Russell, 1974), a highly well-liked paradigm in environmental psychology (Chopdar & Balakrishnan, 2020), served as the basis for the current investigation. This theory is employed to research and analyze the connections between consumers' perceptions of SA and their intention to make a purchase and the mediating effects of advertising value (ADVA) (A. Sharma et al., 2021) and attitude toward SMS advertising (ATSA) (Bananuka et al., 2019; A. Sharma et al., 2021) on these connections. The research also employs the use of the SOR concept in an effort to identify the processes through which purchase intention (PINN) is influenced by SMS advertising perception (SAP). This SOR model emphasizes elements connected to SA content, such as informativeness (INFO), entertainment (ENTT), credibility (CRED), message relevancy (MERE), and irritation (IRRI). These components naturally produce the perception of SA (Stimulus), which develops the ADVA and the ATSA (Organism), and finally results in the PINN (Response). According to this study's hypothesis, SAP is expected to have an impact on ATSA and ADVA, which will ultimately affect PINN.

The incorporation of the higher-order constructs SAP, ATSA, ADVA, and PINN, as well as an analysis of their direct and indirect interactions, make up the present study's significant contribution to the existing research on mobile advertising in Bangladesh. Numerous research has been done on a handful of the correlations between the components mentioned above (Chu, 2018; Y. Wang & Genç, 2019); however, there aren't many studies that focus thoroughly on the direct and indirect interactions between the components in a solitary research framework for young consumers. Most academic research on mobile advertising has employed analytical techniques like structural equation modeling (SEM) (Bakr et al., 2019; Y. Wang & Genç, 2019). This research is the inaugural investigation to employ linear and non-linear models to analyze SA on young consumers in Bangladesh using the SOR approach.

The suggested model is tested and validated in this work using a two-stage analytic procedure. In the initial step, PLS-SEM was employed to test the proposed association and determine how SAP, ADVA, and ATSA affected PINN. The PLS-SEM findings were validated in the next step using neural network modeling (NNM), which was applied to give importance to the significant predictors. The researcher used an artificial neural network (ANN) in this investigation because it handles better than conventional statistical techniques in identifying linear and non-linear interactions rather than only linear ones. This study's design was employed in several additional investigations (S. K. Sharma & Sharma, 2019). The

ANN model was used to rank the relative significance of SAP, ADVA, and ATSA as PINN predictors. Consumers decide to evaluate alternatives based on only a few qualities; therefore, the evaluation phase might not always be conflicting, which is the notion from which the successive multi-method investigation system draws its reasoning (S. K. Sharma & Sharma, 2019). Even with respect to non-compensatory choices made by consumers, the validity of the factor is reliably ensured by the employment of the NNM. As a result, this research affords a more reliable and predictive framework that may go around the primary limitations of the previous model and offer advanced analytics of the purchase intention of the young customer.

2. Literature review

2.1. SMS advertising perception (SAP)

The way consumers view SA is essential in forming a favorable opinion of a company and ultimately influencing their purchasing inclinations. Customers assess the comparative value and usability of SA, and this perception directly affects how they feel about the advertisement (Malik & Dubey, 2013). When a customer is subjected to stimuli, perception serves as a method for analyzing and creating a pleasurable experience (Lindsay & Norman, 2013). This perception is founded on prior customer experiences. It is essential to investigate perception and incorporate it into a comprehensive framework that examines how advertising influences consumers' intentions to make purchases because perception functions as a sensory stimulus and may impact a consumer's behavior toward expected action.

In order to generate a favorable perception about the brand, products, or items within the consumers' minds, marketers attempt to produce stimuli through numerous advertising traits, such as INFO, ENTT, CRED, MERE, and IRRI. If these cues are regulated, customers may acquire a favorable perception, influencing their intention to buy. According to earlier research, consumers are more likely to accept advertising favorably if they believe it to be genuine, factual, credible, and trustworthy (Izquierdo-Yusta, Olarte-Pascual, & Reinares-Lara, 2015; A. Sharma et al., 2021). According to former works A. Sharma et al. (2021); Tsang et al. (2004), perceptions of the advertisement's credibility have a favorable effect on attitudes about advertising, the value of advertising (Brackett & Carr, 2001), and intention to purchase products or goods (Baek & King, 2011).

Similarly to this, when customers get an enjoyable, entertaining, engaging, and humorous ad, they see it as a clear perspective (Chang, 2013), which positively affects their opinion of the value of advertising and helps them have a good attitude (Aydin & Karamehmet, 2017; Martins, Costa, Oliveira, Gonçalves, & Branco, 2019). Furthermore, advertising aims to enlighten a potential buyer about numerous qualities and aspects of the goods (A. Sharma et al., 2021); as a result, the audience views the promotion as helpful, enlightening, and educational and responds favorably to it (Aitken, Gray, & Lawson, 2008). According to Liu, Sinkovics, Pezderka, and Haghirian (2012), A. Sharma et al. (2021), and others, the SA INFO has a crucial effect on the development of a favorable ATSA, the ADVA, and consumer buying behavior.

The customer's self-interest in the SMS marketing content is also advantageous to marketers since it helps the consumer form favorable perceptions of the advertised product. According to Tseng and Teng (2016) and A. Wang (2006), customers' attitudes about the promoted brand and their plans to make future purchases are significantly influenced by how strongly they feel the advertising material is relevant (Rau et al., 2011; Tseng & Teng, 2016). Again, consumers usually become upset and bothered in addition to acquiring a good picture of the product if the advertising annoys, offends, insults, or manipulates them; as a result, they commonly remove the advertisements given to them. Due to this, buyers are more likely to be intolerant and have a terrible attitude toward the offered product (A. Sharma et al., 2021). As a result, their brand's value is diminished by the advertisement (Aydin & Karamehmet, 2017), which fosters a lousy perception of advertising (Tseng & Teng, 2016).

2.2. Advertising value (ADVA)

Consumers' perceived value is the complete evaluation of the utility of goods, products, or services (Zeithaml, 1988). This perceived value is a compromise between what was offered and what was gained

(Yang & Peterson, 2004). The term "ADVA" refers to a "subjective judgment of the comparative value or efficiency of ads to customers," and it is recognized as one of the factors that precede attitude (Ducoffe, 1995). Customers are more likely to react negatively to undervalued advertising (Van den Broeck, Zarouali, & Poels, 2019) than positively to vastly desirable ads (A. Sharma et al., 2021). According to previous work, ADVA has been found to affect attitudes positively (Martins et al., 2019) and PINN (Martins et al., 2019).

2.3. Attitude toward SMS advertising (ATSA)

Consumer attitudes refer to a person's psychological readiness and propensity to behave in a certain way as a result of their characteristics (Pickens, 2005). Customers' attitudes are utilized to describe their behavior in order to get valuable information for marketing choices. According to MacKenzie and Lutz (1989), an attitude is how customers think and express their favorable and unfavorable reactions to advertising. Whether an individual responds positively or negatively to anything, it is a representation of their inner sentiments and a good indicator of how they will act. The advertising perception (AP) is significantly influenced by attitude (Hoeken & den Ouden, 2022; MacKenzie & Lutz, 1989), which is created by the advertisement's INFO, ENTT, CRED, MERE, and IRRI features, as well as by the individual's decision-making process (Ducoffe, 1995; Sharma et al., 2021).

Research by Drossos et al. (2013) examined the claim that PINN strongly correlates with one's attitude toward SA. According to earlier research, behavioral intentions, such as purchase intentions, are influenced by one's ATSA (Aydin & Karamehmet, 2017; Rau et al., 2011). Some research W. T. Wang and Li (2012); Y. Wang and Genç (2019) examines the connections between customer attitude and PINN in the setting of SA. For example, Y. Wang and Sun (2010) contends that a favorable ATSA may improve the likelihood that a consumer would do online shopping. In a similar vein, Korgaonkar and Wolin (2002) reiterates that if the customer has a favorable attitude about the brand's online ads, online spending and buying may improve.

2.4. Purchase intention (PINN)

According to Adjzen and Fishbein (1980) Theory of Reasoned Action (TRA), a consumer's future intentions are significantly impacted by their present behavior. An encouraging attitude is more likely to lead to positive behavior, and the opposite is also true. Furthermore, the degree to which an intention is a firm dramatically impacts how people behave. Determinedly reflected behavior for a specific brand is the result of firmly held preferences for that company. This goal depends on how valuable or beneficial something is regarded to be. The attitudinal behavior has an impact on the intention, either favorably or unfavorably. It has been proven in much research H. Chen and Chen (2020) that one's attitude toward advertisements influences one's intention to buy. A choice to buy is a result of the user's favorable attitude toward the goods (Sharma et al., 2021). Since TRA has gained widespread acceptance for its capacity to explain a variety of human behaviors (Adjzen & Fishbein, 1980), it is warranted to be used in the current study's assessment of the behavioral factors that influence behavior in a digital world. The current research proposes SAP, ADVA, and ATSA as predictors of PINN for an examination in the context of young Bangladeshi consumers based on information gathered from other research.

2.5. Research model

The Stimulus-Organism-Response (SOR) theory Mehrabian and Russell (1974) was employed as the foundation for the suggested model, and mobile advertising literature was used to supplement it (see figure 01). According to the SOR concept, different environmental indicators function as stimuli (S) to arouse internal states in each unique organism (O), which subsequently triggers behavioral responses (R).

One of the drawbacks of SA is how unique it is. Since SA is text-based, the researcher's considerations in this research were limited to content-related issues. Compared to other types of advertising, such as app-based or e-mail advertising, SA provides a lot of benefits. It is widely accessible (no internet connection is necessary), has a quick reach, has a good response percentage, is inexpensive, and provides recent data to measure promotion effectiveness (S. K. Sharma, Sharma, & Dwivedi, 2019). It

has a high user engagement, a simple call to action, monitoring, brief language, and the option for the advertising agency to access personally. These features make it one of the most cost-effective and fruitful methods to contact clients. Due to these advantages of SA, the researcher made an effort to explore the SA aspects (INFO, ENTT, CRED, MERE, IRRI) on a collective level by merging and developing a higher-order construct (HOC), looking into its impact on ADVA and ATSA, and ultimately on PINN. This study suggests that ADVA and ATSA mediate (organism) simultaneously and through serial pathways, which is how the impact of SAP (stimulus) is conveyed to PINN (response). Researchers assert that the ATSA is affected by ADVA as well.

The construct was operationalized in this research using the SOR framework. According to the SOR framework, various environmental cues might trigger internal processes, including thoughts, feelings, and perceptions, which can then impact the responses that are ultimately shown (Chopdar & Balakrishnan, 2020). So, it may be settled that external stimuli do not directly affect consumer behavior; instead, a mediation technique acts as an intermediary, allowing environmental stimuli to trigger internal processes in the customers before the latter result in the final behavior. So, for these characters and components, the SOR framework is a suitable and reasonable selection for this research.

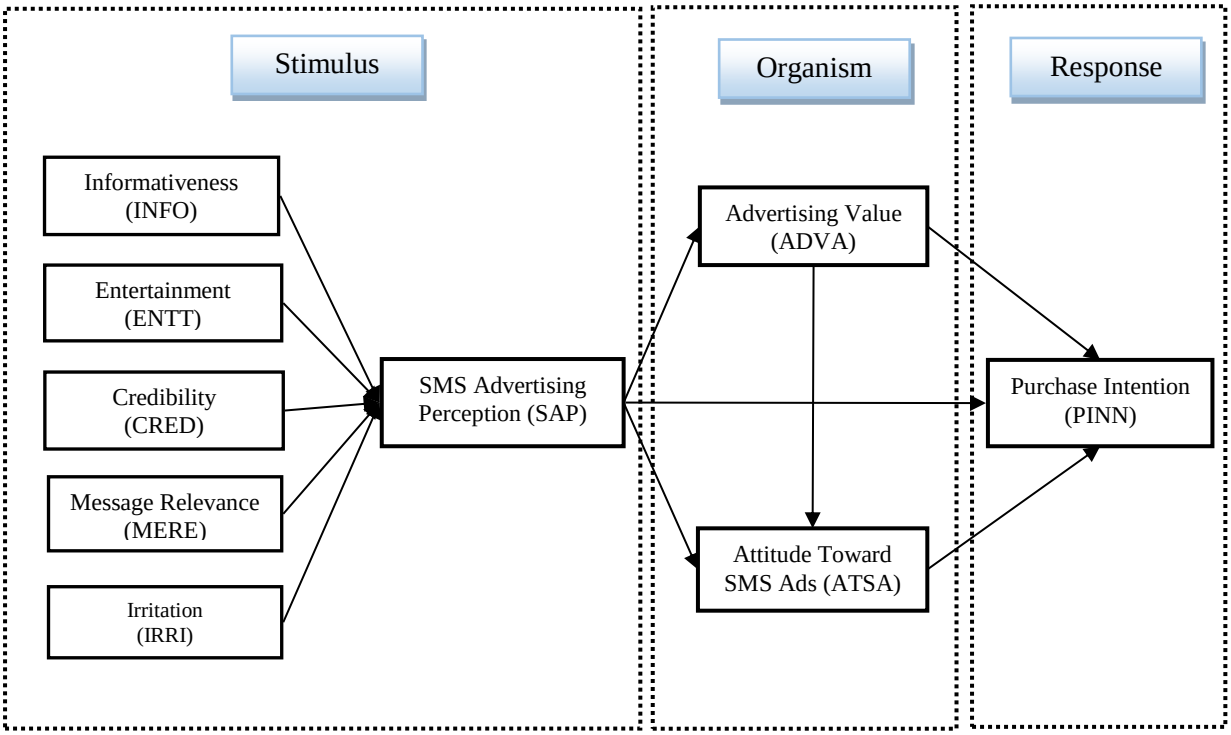

Figure 1. Proposed model.
Source: Adapted from Sharma et al. (2021)

2.6. SMS advertising perception (SAP) employed as a HOC (2nd order)

SAP was characterized as a higher order (HO) reflective-formative construct (2nd order) that combines first-order reflective components (for example, INFO, ENTT, CRED, MERE, and IRRI). Methodologically, HOCs were advocated since they simplify the model by lowering the number of postulated interactions (Thien, 2020). Additionally, it makes results easier to understand, lessens collinearity difficulties (Sarstedt, Hair Jr, Cheah, Becker, & Ringle, 2019), and aids in the generation of accurate and valid empirical findings (Thien, 2020).

The proposal of "SAP" as a HOC is being made for two main reasons. First, to explore the impact of SAP on ADVA (Aydin & Karamehmet, 2017) and ATSA (Wang & Genç, 2019), numerous latest evidence on SA employed the recommended components of AP (INFO, ENTT, CRED, MERE, and IRRI) (Sharma et al., 2021). The structural model has five unique directions when five exogenous constructs are used. This research applies ten distinct paths since the researcher is trying to explain the

variance in ADVA and ATSA. The number of connections is decreased by integrating these five exogenous constructs, leading to a more concise model and more straightforward discussion of results.

Second, several earlier research put out and examined the notion of "AP" as a multidimensional factor using each of the five suggested aspects. This AP construct included INFO (Aaker & Stayman, 1990), MERE and ENTT (Aaker & Stayman, 1990; Fam, 2008), CRED (Aaker & Stayman, 1990; Moldovan, 1984), and IRRI (Aaker & Bruzzone, 1981; Aaker & Stayman, 1990). These investigations also gave rise to the concept of creating a single HOC by integrating the most popular components (Sharma et al., 2021).

The above debate served as an additional basis for integrating all five suggested AP components into a unique HOC. Again, a large body of prior research from independent sources has demonstrated that these five aspects of advertising have a powerful perceptive impact on information processing and consumer perception.

2.7 Formation of hypothesis

The links between ADVA, ATSA, and PINN have been the subject of previous research (Malik & Dubey, 2013; Y. Wang & Genç, 2019); however, it seems that the importance of customer perception in determining and driving these correlations has gone unnoticed. This study proposes SAP as a HO formative construct by combining the five components INFO, ENTT, CRED, MERE, and IRRI. The hypothesized elements of AP were employed in recent research on mobile and SA to look at the impact on ADVA (Arora & Agarwal, 2019; Bakr et al., 2019) and ATSA (Khasawneh & Shuhaiber, 2018; Y. Wang & Genç, 2019). Along with the impact of ADVA on PINN (Martins et al., 2019), the effect of ATSA on PINN (Khasawneh & Shuhaiber, 2018) has recently received significant attention from academics.

Advertising is successful owing to several factors, including INFO, ENTT, CRED, MERE, and IRRI. These factors stimulate customers' thoughts about how pertinent and helpful the promotion is to them. According to earlier research (Aydin & Karamehmet, 2017; Bakr et al., 2019; Islam, Hossain, & Roy, 2021), these advertisement features directly affect ADVA, ATSA, and PINN. There is solid proof that SA message-related characteristics have a substantial role in forming consumers' impressions of the promoted brand, which influences their intentions (Martins et al., 2019; Radder, Pietersen, Wang, & Han, 2010). So, the researcher proposes:

H_1: For young consumers, there is a positive association between SAP and ADVA (H_{1a}), ATSA (H_{1b}), and PINN (H_{1c}).

Numerous research results (Aydin & Karamehmet, 2017; S. Chowdhury & Roy, 2015; Pintado, Sanchez, Carcelén, & Alameda, 2017) have shown a significant association between ADVA and ATSA. This connection is vital in forming the consumer's perception of the marketed brand. Customers may generate a good response and reaction positively to a business when they believe it to have relative merits.

Additionally, if the marketed brand appears credible and worthy to the consumer, previous research implies that they are more likely to form a PINN. Customers assess brand advertisements in terms of the compromise between what is claimed and what is provided. A pleased client is more likely to be drawn to a brand and has a good intention to buy when they have a favorable opinion of the trade-off. Numerous types of research have discovered that ADVA strongly affects consumers' PINN (Martins et al., 2019). So, the researcher proposes:

H_2: For young consumers, there is a positive association between ADVA and ATSA (H_{2a}) and PINN (H_{2b}).

Many additional researchers have argued that developing a good attitude toward brand marketing via online channels might enhance consumers' purchase and expense intentions (Wang & Li, 2012; Wang & Genç, 2019). A customer attitude, an inherent quality of that person, may affect how they think about

any situation or thing, mirrored in how they act. The same holds for the likelihood that a positive perception of a brand advertisement would impact a consumer's propensity to buy that brand. Research has also discovered that, in the SA setting, customer attitude significantly affects their PINN (Aydin & Karamehmet, 2017; Tseng & Teng, 2016). So, the researcher proposes:
H_3: For young consumers, there is a positive association between ATSA and PINN.

2.8. Mediation role of ADVA and ATSA

The current study aims to evaluate the mediation effect of ADVA and ATSA. Previous research supports the mediating role of ADVA between SAP and PINN (L. Chen, Li, & Liu, 2019; A. Sharma et al., 2021) and the mediating effect of attitude between SAP and PINN (Bananuka et al., 2019; Chu, 2018). According to the literature, customers' buying intentions for a brand are often favorably influenced by high perceived value. PINNs can also be enhanced by customers' good attitudes toward a brand. Previous research has effectively examined these direct links; however, for young consumers'; the indirect role of ADVA between SAP and PINN has not yet been investigated. It seems sensible to look at the mediating action of ADVA in the research framework as this research involves the SAP as a factor in the perspective of SA in Bangladesh. Again, in the case of Bangladeshi SMS or Mobile marketing, the indirect effect of ATSA has also not been investigated as a mediating criterion between SAP and PINN. The current study suggests the following propositions for evaluating the mediation effect based on the available evidence and justifications provided:
H_4: For young consumers, ADVA (H_{4a}) and ATSA (H_{4b}) mediate the relationship between SAP and PINN.
H_5: For young consumers, ADVA and ATSA sequentially mediate the relationship between SAP and PINN.

3. Research methodology

3.1. Process of data collection

For data collection, the study used a structured questionnaire. Purposive (Chin et al., 2020; M. R. Khan, Roy, & Pervin, 2022) and convenience sampling techniques were employed to choose participants for in-person interviews and information gathering (S. H. Chowdhury, Roy, Arafin, & Siddiquee, 2019; Roy & Ahmed, 2016). In addition to its economy, speed, and control over participant profiles (Chatzigeorgiou, Christou, & Simeli, 2019), convenience sampling was chosen by the researcher for gathering high-quality information (Roy, Chowdhury, Islam, & Siddique, 2021). A purposive sampling strategy was employed to select an appropriate group of students familiar with SMS advertising. In Bangladesh, it is common to get mobile SMS daily (S. K. R. M. R. Khan & Hossain, 2016; Pervin & Begum, 2022). But the researcher requested a screening question to ensure the responder was qualified to participate in the study: "During the last seven days, did you get any SMS Advertising?".

The components were measured using a well-known scale, although the scale items' phrasing was significantly altered to reflect SA to young customers better. As mentioned, the researcher presented the young consumers' "SAP" as a type 2 higher-order reflective-formative (HORF) concept. The SAP consists of five LO constructs: INFO, ENTT, CRED, MERE, and IRRI. All the observed items of the constructs INFO, ENTT, CRED, MERE, IRRI, ADVA, ATSA, and PINN are taken from the research work of Sharma et al. (2021). The study instrument's questions were structured on a seven-point Likert scale, with the replies of the interviewees being scored from strongly disagree (1) to strongly agree (7).

There were two segments in the research questionnaire. In the first segment, the researcher asked for information on various factors. And in the second, the researcher asked for details on the demographics of the students. A pilot survey with the help of two marketing academics was undertaken before the primary data collection. These scholars suggest choosing the language and order of the questionnaire items. After minor adjustments to guarantee that the replies were precise and valuable, pilot research involving 35 students was carried out (Gumbo, Margaret, & Chagwesha, 2022; Hulland, Baumgartner, & Smith, 2018).

Three hundred fifty questionnaires were sent to students from various universities from July to August 2022. After removing incomplete questions, an analysis was performed on 327 returned responses. The minimal necessary sample size (N =262) was determined using the G*power v3.1.9.4 software (Faul, Erdfelder, Buchner, & Lang, 2009). The researcher used an effect size of 0.05 and statistical power of 0.95 to get a minimum sample. As a result, the researcher obtained a substantial sample size for further analysis. Most of the students (66.4 percent) were business students aged between 21 to 25 years (60.3%) and males (54.4%). Again, most consumers have 4-8 years of experience using a mobile phone (65.8%). 51.1% of the students got less than 10 SMS per day. See Table 1.

Table 1. Students profile (N = 327).

Variables	Categories	f	%
Gender	Female	149	45.6
	Male	178	54.4
Age (in years)	< 21	125	38.2
	21 – 25	197	60.3
	> 25	05	1.5
Experience in using mobile (in years)	< 4	90	27.5
	4 – 8	215	65.8
	> 8	22	6.7
SMS per day	< 10	167	51.1
	10-20	144	44
	> 20	16	4.9
Department	Business Administration	217	66.4
	Agriculture	33	10.1
	Mechanical Engineering	29	8.9
	Civil Engineering	30	9.2
	Electrical and Electronic Engineering	18	5.5

Source: Author's calculation

3.2. Data analysis

PLS-SEM has been utilized to examine and gauge the significance of the research constructs employed in this study in digital settings (Hair Jr, Sarstedt, Ringle, & Gudergan, 2017). This method was chosen for this investigation because it can simultaneously handle serial mediation (Nitzl, Roldan, & Cepeda, 2016) and HORF constructs (Cheah, Roldán, Ciavolino, Ting, & Ramayah, 2021) in a comprehensive framework. PLS-SEM is the appropriate option for this research's data analysis since the researcher provided the "SAP" as a HORF component, and it helps to develop a comprehensive framework (Sharma et al., 2021). The principal target of this research is to forecast the essential constructs, which involves a complete study design (Hair Jr et al., 2017), which is another reason why PLS-SEM was chosen. Measurement and structural model assessment were performed using SmartPLS software (v3.3.5) (Ringle, Wende, & Becker, 2015). A two-step method of data scrutiny has been implemented, as Hair Jr et al. (2017) recommended. Step one elaborated on estimating the measurement model, and step two intricated gauging the structural model.

4. Results and discussions

4.1. Assessment of reflective constructs

For assessing the measurement model, several criteria need to evaluate, namely, factor loadings (λ), Cronbach's alpha (α), composite reliability (CR), average variance extracted (AVE), and discriminant validity (Hair Jr et al., 2017; M. R. Khan & Roy, 2022). All the λ values are above the threshold value of 0.70. A high level of internal consistency is demonstrated by the CR (> 0.7) and α (> 0.7) values, and convergent validity was established by the AVE value of more than 0.50 (Hair et al., 2017). Fornell and Larcker (1981) criterion and the Heterotrait-Monotrait ratio (HTMT) criteria were applied to establish the discriminant validity. All the HTMT ratio scores fall short of the 0.85 conservative cutoffs (Kline, 2015). The analysis shows that the investigation established the measurement model's convergent and discriminant validity. See Tables 2 and 3.

Table 2. Results of construct validity.

Factors	Items	λ	α	CR	AVE
ADVA	ADVA1	0.903	0.903	0.939	0.838
	ADVA2	0.930			
	ADVA3	0.913			
ASTA	ASTA1	0.844	0.927	0.945	0.775
	ASTA2	0.906			
	ASTA3	0.873			
	ASTA4	0.911			
	ASTA5	0.866			
CRED	CRED1	0.876	0.909	0.936	0.785
	CRED2	0.894			
	CRED3	0.905			
	CRED4	0.869			
ENTT	ENTT1	0.879	0.922	0.941	0.762
	ENTT2	0.912			
	ENTT3	0.871			
	ENTT4	0.834			
	ENTT5	0.869			
INFO	INFO1	0.803	0.891	0.919	0.695
	INFO2	0.819			
	INFO3	0.844			
	INFO4	0.849			
	INFO5	0.852			
IRRI	IRRI1	0.885	0.851	0.909	0.770
	IRRI2	0.900			
	IRRI3	0.847			
MERE	MERE1	0.909	0.795	0.907	0.830
	MERE2	0.912			
PINN	PINN1	0.916	0.936	0.955	0.840
	PINN 2	0.930			
	PINN 3	0.910			
	PINN 4	0.910			

Source: Author's calculation

Table 3. Results of discriminant validity.

Fornell-Larcker results								
	ADVA	ASTA	CRED	ENTT	INFO	IRRI	MERE	PINN
ADVA	***0.915***							
ASTA	0.775	***0.880***						
CRED	0.551	0.546	***0.886***					
ENTT	0.497	0.550	0.416	***0.873***				
INFO	0.506	0.508	0.423	0.440	***0.834***			
IRRI	0.504	0.535	0.403	0.401	0.381	***0.878***		
MERE	0.564	0.577	0.485	0.521	0.442	0.608	***0.911***	

PINN	0.782	0.792	0.476	0.530	0.463	0.540	0.631	***0.917***

HTMT results

	ADVA	ASTA	CRED	ENTT	INFO	IRRI	MERE	PINN
ADVA								
ASTA	0.845							
CRED	0.606	0.591						
ENTT	0.539	0.591	0.449					
INFO	0.561	0.554	0.468	0.482				
IRRI	0.572	0.599	0.454	0.452	0.432			
MERE	0.665	0.672	0.571	0.604	0.522	0.741		
PINN	0.850	0.849	0.513	0.567	0.501	0.600	0.732	

Note: The diagonal elements (italic and bold) in the above table are the square root of the AVEs, and the off-diagonal values represent correlations between the various factors.
Source: Author's calculation

4.2. Assessment of formative construct

In this work, SAP was suggested as a type 2 HORF construct. According to Becker, Klein, and Wetzels (2012), the researcher tested the HORF constructs using a two-step procedure. The researcher used the disjoint two-stage approach. In the 1st stage, latent variable scores of the LOC were calculated. Then these scores from the PLS method were utilized in the 2nd stage to determine weight and significance. The formative construct was evaluated using the items' VIF values and weights. Collinearity is not a significant issue because the VIF values are below the 3.3 thresholds (Hair et al., 2017). The researcher used the bootstrapping method to evaluate the significance of the weights (taking 5000-resamples). The results show that the indicator's weights are all statistically significant ($p < 0.001$). The findings illustrate how the formative constructs contributed differently to the development of a HORF construct. Table 4 represents the results.

Table 4. Results of the HOC assessment.

HOC	LOCs	VIF	OW	t	95% BCa-CIs
SMS advertising perception (SAP)	CRED	1.459	0.262	15.921*	[0.233, 0.298]
	ENTT	1.529	0.263	16.153*	[0.234, 0.299]
	INFO	1.427	0.246	12.969*	[0.209, 0.285]
	IRRI	1.659	0.263	13.275*	[0.225, 0.303]
	MERE	2.008	0.295	17.504*	[0.266, 0.332]

Note: *p<0.001, HOC = Higher order construct, LOC = Lower order construct, OW = Outer weights
Source: Author's calculation

4.3. Assessment of the structural model

The structural model needed to be examined to confirm the proposed correlation once the measurement model had been validated (Hair Jr et al., 2017; Roy, 2022). The researcher looked at the collinearity to ensure there wasn't a multi-collinearity issue. The results reveal that the construct's VIF scores are significantly lower than the value of 5. The structural model was evaluated with the help of path coefficients (β), R^2, and Q^2. The results affirm all the direct hypotheses are supported. See Table 5.

There is a significant positive correlation between SAP and ADVA (β = 0.699, t = 22.198), ATSA (β = 0.357, t = 10.585), and PINN (β = 0.176, t = 5.228). Again, there is a significant relationship between ADVA and ATSA (β = 0.525, t = 13.998) and PINN (β = 0.359, t = 5.857). Furthermore, ATSA is a significant predictor of PINN (β = 0.387, t-value = 7.156). Hence, the outcomes supported all the direct hypotheses (H_{1a}, H_{1b}, H_{1c}, H_{2a}, H_{2b}, H_3) (See figure 02).

4.4. Assessment of the mediation analysis

The researcher used the transmittal technique to assess the mediation effect (Rungtusanatham, Miller, & Boyer, 2014). The bootstrapping method was employed to determine the 95% bias-corrected confidence interval of the indirect impact, as recommended by Hair et al. (2017), using 5000 subsamples. The researcher employed the decision tree by Nitzl et al. (2016) to categorize mediation. The findings of the indirect effect analysis indicate that the two indirect routes through ATSA (β = 0.251, t = 5.369) and ADVA (β = 0.138, t = 5.726) are significant in connecting the SAP to the PINN. Furthermore, the serial mediation impact of ADVA and ASTA between the relationship of SAP and PINN is also significant (β = 0.142, t = 6.904). So, hypotheses H_{4a}, H_{4b}, and H_5 are supported. Additionally, SAP has a substantial direct impact on PINN (β = 0.176, t = 5.228, p < 0.001), which favors complementing partial mediation (See Table 5).

Table 5. Results of the structural model.

H	Relationships	β	SE	t-value	95% BCa-CIs	Supported
	Direct paths					
H_{1a}	SAP -> ADVA	0.699	0.031	22.198*	[0.611; 0.761]	✓
H_{1b}	SAP -> ASTA	0.357	0.034	10.585*	[0.266; 0.444]	✓
H_{1c}	SAP -> PINN	0.176	0.034	5.228*	[0.095; 0.253]	✓
H_{2a}	ADVA -> ASTA	0.525	0.038	13.994*	[0.442; 0.611]	✓
H_{2b}	ADVA -> PINN	0.359	0.061	5.857*	[0.261; 0.467]	✓
H_3	ASTA -> PINN	0.387	0.054	7.156*	[0.272; 0.501]	✓
	Indirect paths					
H_{4a}	SAP -> ADVA -> PINN	0.251	0.047	5.369*	[0.176; 0.338]	✓
H_{4b}	SAP -> ASTA -> PINN	0.138	0.024	5.726*	[0.092; 0.198]	✓
H_5	SAP -> ADVA -> ASTA -> PINN	0.142	0.021	6.904*	[0.096; 0.201]	✓

Note: *p<0.001
Source: Author's calculation

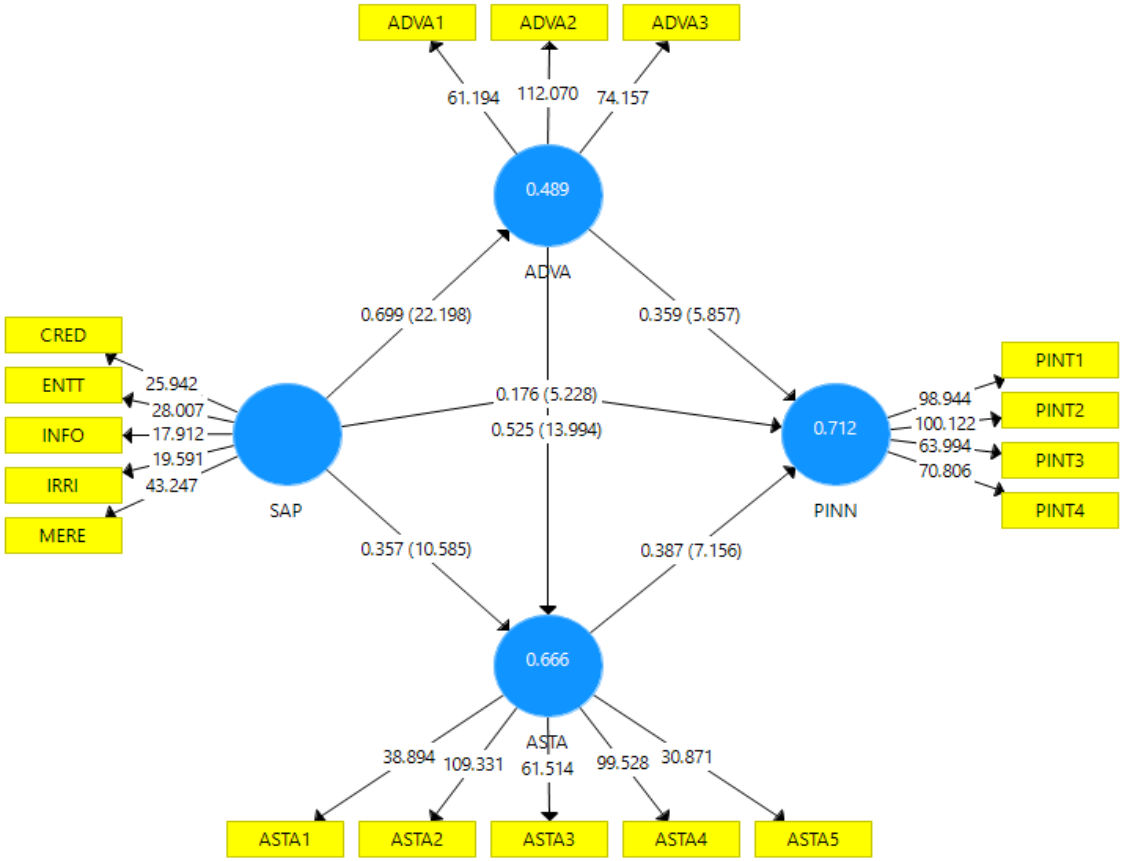

Figure 2. Results of the structural model.
Source: Author's calculation

4.5. Assessment of the explanatory power and predictive relevance

The coefficient of determination (R^2), effect size (f^2), and predictive significance (Q^2_predict) were determined in order to evaluate the structural model's adequacy. With SAP accounting for 48.9% of the variation in ADVA and SAP and ADVA accounting for 66.6% of the variance in ATSA, the model has significant explanatory power. Finally, it is demonstrated that SAP, ADVA, and ATSA have a significant explanatory capacity in the model by predicting 71.2% of the variation in PINN.

Again, according to the effect size, with a medium effect size, ATSA (f^2 = 0.173) is discovered to be the most vital PINN predictor. Similarly, ADVA (f^2 = 0.161) has a medium, and SAP (f^2 = 0.046) has a small effect size for predicting PINN (Cohen, 2013). In the final stage, the predictive significance was assessed employing Stone-Geisser Q^2 (Stone, 1974). The results of the Q^2 value are more than 0 for every exogenous construct (ADVA = 0.483, ATSA = 0.522, and PINN = 0.495), indicating strong predictive relevance of the model (Chin et al., 2020). The results reveal increased consistency in the model's predictive ability, with Q^2_predict scores being greater than Q^2 scores—the outcomes presented in table 6.

Table 6. The outcomes of R^2, f^2, Q^2, and Q^2_predict.

Constructs	R^2	f^2	Q^2	Q^2_predict
ADVA	0.489	0.161	0.406	0.483
ASTA	0.666	0.173	0.511	0.522
PINN	0.712	0.046	0.593	0.495

Note: Q^2 values represent (0.02 = Small; 0.15 = Medium; 0.35 = Large) predictive relevance.
Source: Author's calculation

4.6. Results of the Neural network (NN)

Artificial neural network (ANN) modeling is a popular machine-learning technique that is employed nowadays in many academic disciplines. For example, mobile commerce (Chong, 2013), services of mobile banking (Sharma & Sharma, 2019), and so on. An ANN is described by Haykin (2001) as "an enormously parallel distributed processor comprised of basic processing elements that have a natural predisposition to retain experimental knowledge and make it accessible for usage." ANN makes an effort to simulate how the human brain functions. Through "training," ANN reveals the hidden correlations in the given dataset, and "testing" illustrates how the learning has been applied. Because ANN is devoid of assumptions about multivariate data distribution, it is utilized to examine complicated associations (Chong, 2013). Over conventional statistical techniques, for example, SEM or regression, ANN offers a substantial advantage. ANN can assess non-linear correlations between factors in a model, whereas traditional statistical approaches can only examine linear correlations.

4.7. Neural network results validation

An ANN model was developed using SPSS version 22. This study's ANN model was trained using a widely employed feed-forward back-propagation multilayer training technique (Sharma et al., 2021). The input and hidden nodes were implemented using multilayer perceptron and sigmoid activation algorithms (Sharma & Sharma, 2019). This study employed a 10-fold cross-validation approach to prevent overfitting, which is an issue for ANN. The network computing nodes research does not contain heuristics (Sharma et al., 2021). As a result, this work employed the commonly used Root Mean Square Error (RMSE) to confirm the ANN evaluation results, as many academics recommended (Chong, 2013; Sharma et al., 2021). In this study, training was done with 90% of the data points, while testing was done with the remaining 10% (Leong, Jaafar, & Ainin, 2018).

According to the present research, the ANN analysis utilized just one model. The ANN model's input layer (neurons) included SAP, ADVA, and ATSA, while the output layer included PINN (See figure 3). The RMSE represents the training and testing error. Table 7 describes the RMSE assessment. The training and testing operations' average RMSE scores, which are 0.072 and 0.066, respectively, are pretty low. Consequently, the researcher affirms that the model fits perfectly and the ANN analysis's findings were entirely trustworthy (Chong, 2013; Sharma et al., 2019).

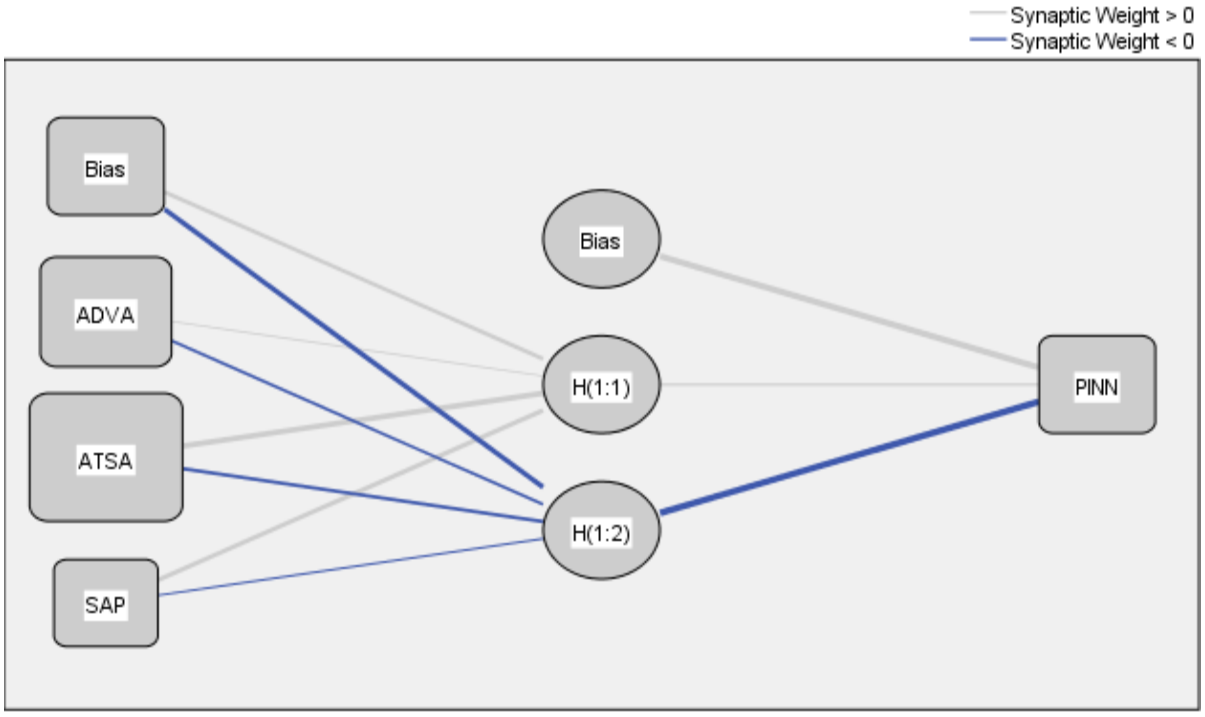

Figure 3. ANN architecture.
Source: Author's calculation

Table 7. RMSE results.

Training		Testing		Total sample
N	RMSE	N	RMSE	
289	0.072	38	0.066	327
297	0.072	30	0.067	327
295	0.082	32	0.049	327
290	0.070	37	0.074	327
286	0.073	41	0.058	327
296	0.071	31	0.052	327
287	0.070	40	0.067	327
295	0.069	32	0.084	327
289	0.073	38	0.063	327
294	0.069	33	0.080	327
Mean	***0.072***		***0.066***	
SD	***0.003***		***0.011***	

Source: Author's calculation

4.8. Sensitivity analysis

According to modifications in the independent factors linked to the dependent variable, sensitivity analysis in a framework establishes how the dependent variable can vary. The relevance of SAP, ADVA, and ATSA in predicting the PINN has been averaged in the current investigation to arrive at the result (Chong, 2013) (Table 8). From the ANN analysis, ATSA is the most crucial predictor for PINN, with the highest normalized importance of 97.36%, followed by ADVA (70.40%) and SAP (52.14%) based on the sensitivity analysis outputs. Therefore, based on the findings of ANN, the

researcher can infer that the ATSA is the most influential construct for predicting the PINN of young consumers compared to ADVA and SAP.

Table 8. Sensitivity analysis.

NN	ADVA	ATSA	SAP
1	0.346	0.493	0.161
2	0.341	0.415	0.244
3	0.405	0.298	0.297
4	0.392	0.429	0.179
5	0.342	0.491	0.167
6	0.211	0.425	0.364
7	0.261	0.510	0.229
8	0.319	0.406	0.275
9	0.250	0.545	0.205
10	0.312	0.473	0.214
Average Importance	**0.3179**	**0.4485**	**0.2335**
Normalized Importance	**70.40%**	**97.36%**	**52.14%**

Source: Author's calculation

4.9. Discussion

This study's main goal was to ascertain the "What is the process through which SAP influences PINN of young consumers? Employing a multi-analytic methodology, this was accomplished utilizing hybrid PLS-SEM-ANN modeling. The research examined the direct effects of SAP on ADVA, PINN, and ATSA; ADVA on PINN and ATSA; and ATSA on PINN. All the direct hypotheses are supported. The findings imply that SAP significantly improves ADVA, PINN, and ATSA. Again, ADVA has significant impacts on ATSA and PINN; also, ATSA has positive effects on PINN. This new evidence improves our comprehension of how SAP influences PINN. The present study's results conform with previous research conclusions that there is a strong relationship between SAP, ADVA, ATSA, and PINN (Salehzadeh & Pool, 2017; A. Sharma et al., 2021). The study's findings also supported the hypothesis that ADVA causes the development of ATSA and PINN. Previous investigations (Martins et al., 2019; Sharma et al., 2021) have confirmed this association and explained how ADVA significantly impacts the correlation between PINN and ATSA. The findings of this study show that SAP, ADVA, and ATSA are essential predictors of PINN.

The study's subsequent examination is to evaluate the indirect impact of ADVA and ATSA on the connection between SAP and PINN. The outcomes validated that ADVA and ATSA had a mediating effect on the hypothesized association. This finding shows that ADVA and ATSA are crucial in increasing the PINN of young consumers. Interestingly, the indirect impact was more remarkable when compared to the direct effects of SAP on PINN via ADVA, indicating that ADVA is a crucial determinant. So, most of the impact of SAP on PINN was transferred via ADVA.

Although all of the factors that predicted the PINN was significant, it was unclear how they all related to the PINN. Because of this, the research used ANN modeling to rank the predictors of PINN. Similar to the PLS-SEM result, the outcomes of the ANN also reveal that ATSA is the utmost pertinent predictor of PINN.

4.9.1. Theoretical implications

This study's conclusions have a wide range of theoretical ramifications. First, the study proposes a study model for mobile advertising that explains how SAP affects PINN using the SOR framework in the Bangladeshi environment. Second, the study determined that SAP is a type 2 HORF construct and tested it. The sub-dimensions of SAP comprise INFO, ENTT, CRED, MERE, and IRRI. The outcomes support the HO specification of the SAP construct. As a result, by detailing how the SAP sub-dimensions

interact, this research significantly contributes to the literature on advertising. In Bangladeshi mobile advertising, SAP has not been thoroughly investigated as a HO construct for young customers. By examining the interactions between SAP, ADVA, ATSA, and PINN, this work aims to close that gap. This current work pointedly augments the frame of knowledge on mobile advertising by describing the link between these parameters. The work it has done on the method by which the impact of SAP is communicated to PINN is by far its significant contribution. The comprehensive modeling and exploration of the indirect and direct interactions between SAP, ADVA, ATSA, and PINN are one of this work's relevant explanatory contributions. The study's model, which takes an integrated approach and links theory to practice to provide both theoretical and practical consequences, is more comprehensive than other theories.

4.9.2. Practical implications

The present work includes numerous applications that might aid professionals in creating their advertising strategies. The discoveries of this study specify that each of the five identified SAP aspects is significant. However, the enormous contributions to SAP creation have come from MERE and ENTT, followed by IRRI, CRED, and INFO. Because of this, marketing companies that want SA to be successful need to design and send SMSs that are relevant and amusing in terms of their substance. Consumers may respond positively to entertaining messages that provide meaning, which will aid in future brand recall and promote the intent to buy the brand. By disclosing accurate, trustworthy, and reliable information about a brand's products, the SA must exemplify CRED.

The research also revealed a significant positive association between SAP and ADVA, ATSA, and PINN. The robust connection is between SAP and ADVA, followed by ATSA and PINN. Previous research on customer behavior has demonstrated that unfulfilled expectations and requirements are the basis for ADVA.

So, if advertisers are aware of these expectations and express them via their brand marketing, it will help to generate effectiveness of advertising which leads to a high intention to buy products

The results of the ANN study showed that ATSA is the most vital determinant of PINN. ATSA relies on the message's utility and applicability to the audience, which heavily depends on consumer qualities outside their demographics. This property emphasizes the requirement for intelligent content SA adaptation by different customer bases. This study thus contributes fresh perspectives on a topic that has received little attention. This work boosts the SOR model by recognizing vital mediating variables that aid us in realizing how ADVA, ATSA, and PINN are inclined by SAP. It progresses the researcher's explanation of the correlation between these constructs. As a result, marketers, and marketing companies can create plans to efficiently optimize the usage of SA in sponsoring their products in the commercial marketplace, therefore maximizing the influence of marketing on the PINN of millennial consumers.

And last, all forms of advertising, including mobile advertising, may benefit from the study's conclusions. The justification is that the majority of commercials rely heavily on content (writing), which is the foundation of effective advertising. Furthermore, in the age of social media platforms or mobile instant message (MIM) systems, the significance of SA shouldn't be understated. These platforms rely on technology, are generally incompatible with one another, and make use of internet access (Tseng & Teng, 2016). Contrarily, SA does not need to meet these kinds of criteria. Without these constraints, SMSs may be utilized as a direct interface to communicate with clients, increasing the likelihood that they will respond more quickly.

5. Conclusion

In this paper, the HO construct SAP is suggested and verified. Using the S-O-R architecture, this study also illustrates how SAP affects PINN. This study's S-O-R framework-based hypothesis stated that AP directly affects ADVA, ATSA, and PINN and that, via a parallel and sequential method, the impact of AP is then indirectly communicated to PINN through ADVA and ATSA. The investigation results

provide evidence in favor of all direct and indirect assumptions. By illuminating how SAP, ADVA, and ATSA affect PINN, the results add advanced knowledge in the mobile advertising area.

5.1 Limitations

There are several limits to the work that demands more research. For example, the study concentrated on cross-section data and employed convenience sampling that restricts the universal applicability of the outcomes. Second, the research is limited to the Dhaka metropolitan area in Bangladesh, and customer experience may differ in other places. Only young customers were considered in this study; outcomes for other consumers may differ.

5.2 The directions of future research

Forthcoming studies may utilize longitudinal using a random sample to overcome these constraints. Future studies should concentrate on different geographic regions to explore the topic more. Additionally, future studies may consider using a mixed-method approach to overcome the shortcomings of the quantitative methodology in order to comprehend ADVA and ATSA more thoroughly. Examining the applicability of the comprehensive model suggested and proven in this work to other advertising mediums, for example, video app advertising, is one robustly advised future path for investigation. And employ innovative data analytics methods, for example, artificial intelligence and machine learning, to reach more detailed findings and recommendations.

Acknowledgments

The author thanked all the participants.

Disclosure statement

The author reported no potential conflict of interest.

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