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Impact of SMS Advertising on Purchase Intention for Young Consumers

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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.
Conclusions: This study shows that SMS advertising perception influences purchase intention among Bangladeshi university students, with attitude and ad value mediating this effect. Using structural equation modeling and artificial neural networks, it provides insights for marketers in post-COVID mobile advertising. Future research should explore broader demographics and regions.
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.
Contributions: 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.

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

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1. Introduction

Globally, the use of mobile communication technology and portable devices has increased dramatically in recent years (A. Sharma, Dwivedi, Arya, & Siddiqui, 2021). This breakthrough has provided marketers with new ways to approach consumers. Along with accelerating progress, these technologies provide advertisers with customizable benefits such as consumer preferences, taste patterns, a focused customer base and options, and the ability to identify future clients. 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 for 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). SMS is a superior advertising method for targeting certain market groups, particularly young consumers (Laurie, Mortimer, & Beard, 2019), with highly tailored, relevant, timely, and rapid marketing messages (Drossos, Giaglis, Vlachos, Zamani, & Lekakos, 2013). SMS advertising is frequently favored over other mobile promotional methods because of its ease of use and lower technology reliance (Khan & Roy, 2023; 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, and 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 also relatively high. Approximately 98% of the SMSs were read by receivers before the end of the day, with 90% read within 3 minutes of delivery (A. Sharma et al., 2021).

Regarding 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, 2012; Rahman & Shanjabin, 2022). Furthermore, because of their characteristics, such as 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 campaigns.

The theory behind the Stimulus-Organism-Response (SOR) framework (Mehrabian & Russell, 1974), a highly popular 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) Bamoriya (2012); A. Sharma et al. (2021) on these connections. This study also employs the SOR concept to identify the processes through which Purchase Intention (PINN) is influenced by SMS Advertising Perception (SAP). The SOR model emphasizes elements connected to SA content, such as Informativeness (INFO), Entertainment (ENTT), Credibility (CRED), Message Relevance (MERE), and Irritation (IRRI). These components naturally produce the perception of SA (Stimulus), which develops ADVA and ATSA (Organism), and finally results in the PINN (Response). According to the hypothesis of this study, 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 studies have been conducted on a handful of correlations between the components mentioned above (Chu, 2018; Y. Wang & Genç, 2019). However, no study has thoroughly focused 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 such as Structural Equation Modeling (SEM) (Bakr et al., 2019; Y. Wang & Genç, 2019). This study is the inaugural investigation to employ linear and non-linear models to analyze SA on young consumers in Bangladesh using the SOR approach.

The proposed model was tested and validated in this study using a two-stage analytical procedure. In the initial step, PLS-SEM was employed to test the proposed association and determine how SAP,

ADVA, and ATSA affect PINN. The PLS-SEM findings were validated in the next step using Neural Network Modeling (NNM), which was applied to give importance to significant predictors. An Artificial Neural Network (ANN) was used in this investigation because it handles linear and non-linear interactions better than conventional statistical techniques. The design of this study was employed in several additional investigations (S. K. Sharma, Sharma, & Dwivedi, 2019). The ANN model was used to rank the relative significance of SAP, ADVA, and ATSA as predictors of PINN. 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 et al., 2019). Even with respect to non-compensatory choices made by consumers, the validity of the factor is reliably ensured by employing the NNM. This study provides a more reliable and predictive framework that may overcome the primary limitations of the previous model and offer advanced analytics of the purchase intention of young customers.

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 intentions. Customers assess the comparative value and usability of SA, and this perception directly affects their feelings about the advertisement (Malik & Dubey, 2013). When a customer is subjected to stimuli, perception serves as a method for analyzing and creating pleasurable experiences (Lindsay & Norman, 2013). This perception is based 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 purchase because perception functions as a sensory stimulus and may impact a consumer's behavior toward the expected action.

To generate a favorable perception of 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 favorable perceptions, 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 studies conducted by A. Sharma et al. (2021); (Tsang et al., 2004), perceptions of advertisement credibility have a favorable effect on attitudes toward advertising, the value of advertising (Brackett & Carr Jr, 2001), and the intention to purchase products or goods (Baek & King, 2011).

Similarly, when customers receive an enjoyable, entertaining, engaging, and humorous advertisement, they see it from 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 potential buyers about the numerous qualities and aspects of goods A. Sharma et al. (2021) as a result, audiences perceive the promotion as helpful, enlightening, and educational respondents favorably to it (Aitken, Gray, & Lawson, 2008). According to Liu, Sinkovics, Pezderka, and Haghirian (2012); A. Sharma et al. (2021), SA INFO has a crucial effect on the development of favorable ATSA, ADVA, and consumer buying behavior.

The customer's self-interest in SMS marketing content is also advantageous to marketers because it helps the consumer form favorable perceptions of the advertised product. According to Tseng and Teng (2016) ; A. Wang (2006), customers' attitudes toward 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). 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. Therefore, buyers are more likely to be intolerant and have a negative attitude toward the offered product (A. Sharma et al., 2021). As a result, their brand value is diminished by advertisements (Aydin & Karamehmet, 2017), which fosters a negative perception of advertising (Tseng & Teng, 2016).

2.2 Advertising Value (ADVA)

Consumers' perceived value is a complete evaluation of the utility of goods, products, or services (Zeithaml, 1988). This perceived value is a compromise between what is offered and what is 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, and Poels (2019) than positively to vastly desirable ads (A. Sharma et al., 2021). According to previous studies, ADVA positively affects attitudes 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 used to describe their behavior to obtain valuable information for marketing choices. According to MacKenzie and Lutz (1989), 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 in the future. 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; A. Sharma et al., 2021).

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 ATSA (Aydin & Karamehmet, 2017; Rau et al., 2011). Some research W. T. Wang and Li (2012); Y. Wang and Genç (2019) examines the attitude sons between customer context attitude and PINN in the setting of SA. For example, Y. Wang and Sun (2010) contend that a favorable ATSA may improve the likelihood that consumers will shop online. In a similar vein, Korgaonkar and Wolin (2002) reiterate that if customers have a favorable attitude toward a brand's online ads, online spending and buying may improve.

2.4 Purchase Intention (PINN)

According to Heilbroner, Ajzen, Fishbein, and Thurow (1980), the Theory of Reasoned Action (TRA) suggests that a consumer's future intentions are significantly influenced by their current 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 firm dramatically impacts how people behave. A 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. Attitudinal behavior impacts 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. The choice to buy is a result of the user's favorable attitude toward the goods (A. Sharma et al., 2021). Since TRA has gained widespread acceptance for its capacity to explain a variety of human behaviors (Heilbroner et al., 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 examination in the context of young Bangladeshi consumers based on information gathered from other studies.

2.5 Research Model

Figure 1 shows that the Stimulus-Organism-Response (SOR) theory proposed by Mehrabian and Russell (1974) was employed as the foundation for the proposed model, and mobile advertising literature was used to supplement it . According to the SOR (Stimulus-Organism-Response) framework, various environmental indicators act as stimuli (S) that provoke internal states within each unique organism (O), which then lead to a behavioral response (R).

One of the drawbacks of SA is its uniqueness. Because SA is text-based, the researcher's considerations in this study were limited to content-related issues. Compared to other types of advertising, such as app-based or e-mail advertising, SA provides many benefits. It is widely accessible (no Internet connection is necessary), has a quick reach, a good response percentage, is inexpensive, and provides recent data to measure promotion effectiveness (S. K. Sharma et al., 2019). It has 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 for contacting clients. Owing to these advantages of SA, the researcher made an effort to explore the SA aspects (INFO, ENTT, CRED, MERE, and IRRI) on a collective level by merging and developing a Higher-Order Construct (HOC), examining 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 the SAP (stimulus) is conveyed to the PINN (response). Researchers have asserted that the ATSA is also affected by ADVA.

This construct was operationalized in this study 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). Therefore, it may be concluded 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 customers before the latter result in the final behavior. Therefore, for these characters and components, the SOR framework is a suitable and reasonable selection for this research.

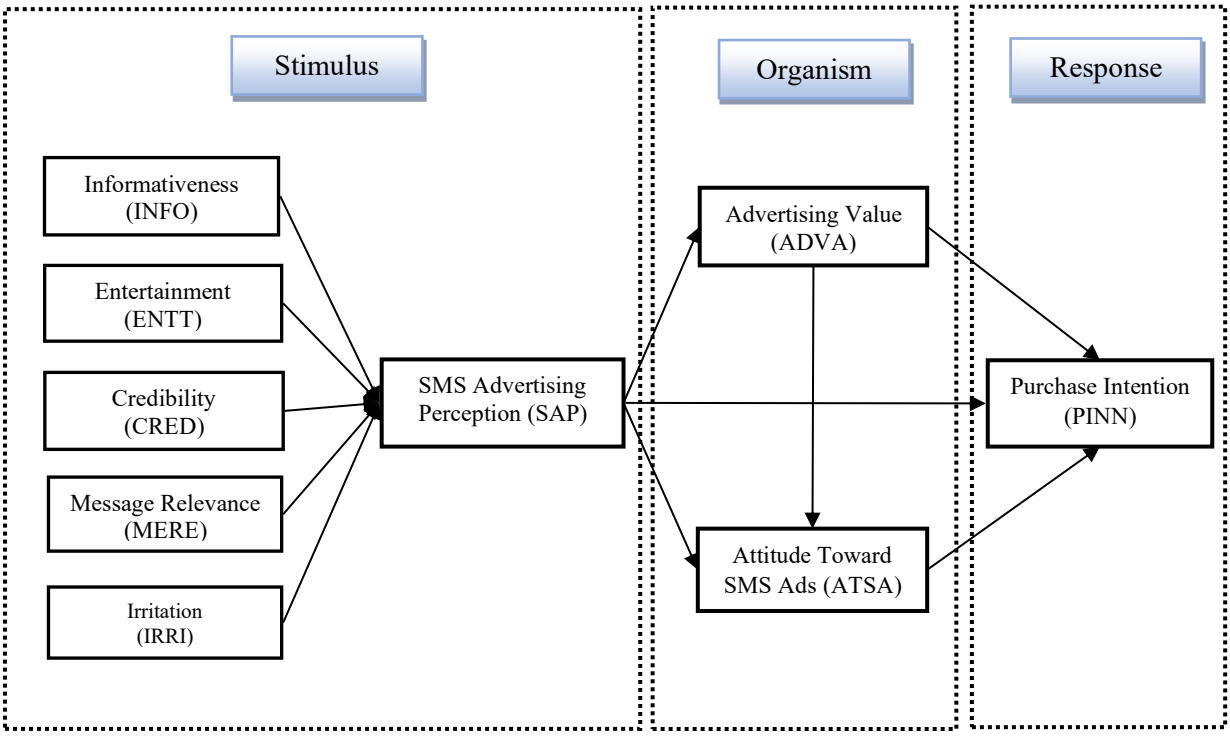

Figure 1. Proposed model

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 (e.g., INFO, ENTT, CRED, MERE, and IRRI). Methodologically, HOCs have been advocated because they simplify the model by lowering the number of postulated interactions (Thien, 2020). Additionally, it makes the 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 an HOC was made for two main reasons. First, to explore the impact of SAP on ADVA Aydin and Karamehmet (2017) and ATSA Y. Wang and Genç (2019), numerous studies on SA employed the recommended components of AP (INFO, ENTT, CRED, MERE, and IRRI) (A. 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 was decreased by integrating these five exogenous constructs, leading to a more concise model and a more straightforward discussion of the results.

Second, several earlier studies have examined the notion of AP as a multidimensional factor using each of the five suggested aspects of AP. This AP construct included INFO (Aaker & Stayman, 1990), MERE and ENTT (Aaker & Stayman, 1990; Fam, 2008), CRED (Aaker & Stayman, 1990; Mehrabian & Russell, 1974), and IRRI (Aaker & Bruzzone, 1981); (Aaker & Stayman, 1990). These investigations also led to the concept of creating a single HOC by integrating the most popular components (A. Sharma et al., 2021).

This debate served as an additional basis for integrating all five suggested AP components into a unique HOC. 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 relationships between ADVA, ATSA, and PINN have been explored in previous studies Malik and Dubey (2013); Y. Wang and Genç (2019). However, the role of customer perception in shaping and driving these correlations has often been overlooked. This study proposes SAP as a formative construct of HO, integrating the five components: INFO, ENTT, CRED, MERE, and IRRI. The hypothesized components of AP have been examined in recent research on mobile applications and SA to assess their impact on ADVA (Arora & Agarwal, 2019); Bakr et al. (2019) and ATSA (Khasawneh & Shuhaiber, 2018; Y. Wang & Genç, 2019). In addition to the impact of ADVA on PINN (Martins et al., 2019), the effect of ATSA on PINN Khasawneh and Shuhaiber (2018) has recently received significant attention from researchers.

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 and Karamehmet (2017), Bakr et al. (2019), Islam, Hossain, and Roy (2021) these advertisement features directly affect ADVA, ATSA, and PINN. There is solid proof that 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). Therefore, the researcher proposes the following hypothesis:

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

Numerous studies, including those by Aydin and Karamehmet (2017); S. Chowdhury and Roy (2015), Pintado, Sanchez, Carcelén, and Alameda (2017) have demonstrated a significant association between ADVA and ATSA, which plays a crucial role in shaping consumer perception of the marketed brand. Customers are more likely to respond positively to a business when they perceive it to have relative merits.

Additionally, if the marketed brand appears credible and worthy to the consumer, previous research implies that consumers are more likely to form a PINN. Customers assess brand advertisements based on 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 studies have found that ADVA strongly affects consumers' PINN (Martins et al., 2019). Therefore, the researcher proposes the following hypothesis:

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

Many researchers have argued that developing a good attitude toward brand marketing via online channels might enhance consumers' purchase and expense intentions (W. T. Wang & Li, 2012; Y. Wang & Genç, 2019). A customer attitude, an inherent quality of that person, may affect how they think about any situation or thing, as 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 found that, in the SA setting, customer attitude has a significant impact on their PINN (Aydin & Karamehmet, 2017; Tseng & Teng, 2016). The researcher proposes the following:

H_3: For young consumers, there is a positive association between ATSA and PINN.

2.8 Mediation Role of ADVA and ATSA

This study aimed to evaluate the mediating effects of ADVA and ATSA. Previous research supports the mediating role of ADVA between SAP and PINN A. Sharma et al. (2021), L. Chen, Li, and Liu (2019) and the mediating effect of attitude between SAP and PINN (Bananuka et al., 2020; Chu, 2018). According to the literature, customers' buying intentions for a brand are often favorably influenced by a high perceived value. PINNs can also be enhanced by customers' positive attitudes toward a brand. Previous research has effectively examined these direct links; however, the indirect role of ADVA between SAP and PINN among young consumers has not yet been investigated. It seems sensible to look at the mediating action of ADVA in the research framework as this research involves 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 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 the 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

A structured questionnaire was used for data collection. Purposive Chin et al. (2020), Khan and Roy (2023) 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 who were familiar with SMS advertising. In Bangladesh, it is common to receive mobile SMS daily (Pervin & Begum, 2022; Roy, Khan, & Hossain, 2016). However, the researcher requested a screening question to ensure that 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 phrasing of the scale items was significantly altered to better reflect SA in young customers. As mentioned, the researcher presented young consumers with 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 observed items of the constructs INFO, ENTT, CRED, MERE, IRRI, ADVA, ATSA, and PINN were taken from the research work of (A. Sharma et al., 2021). The questions in the study instrument were structured using a seven-point Likert scale, with interviewees' responses ranging from strongly disagree at the lowest value of 1 to strongly agree at the highest value of 7.

The research questionnaire comprised two segments. In the first segment, the researcher asked for information on various factors. In the second segment, the researcher asked for details regarding the students' demographics. A pilot survey was conducted with the help of two marketing academics 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 conducted (Gumbo, Margaret, & Chagwesha, 2022; Hulland, Baumgartner, & Smith, 2018).

A total of 350 questionnaires were sent to students from various universities from July to August 2022. After removing incomplete questions, 327 responses were analyzed. The minimum necessary sample size (N =262) was determined using 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 obtain a minimum sample. As a result, the researcher obtained a substantial sample size for further analyses. Most of the students (66.4 percent) were business students aged between 21 and 25 years (60.3%) and males (54.4%). Moreover, most consumers had 4-8 years of experience using mobile phones (65.8%). A total of 51.1% of the students received less than 10 SMS per day. See Table 1.

Table 1. Student profiles (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

3.2 Data Analysis

PLS-SEM was utilized to examine and gauge the significance of the research constructs employed in this study in digital settings (Hair Jr, Hair Jr, Sarstedt, Ringle, & Gudergan, 2017). This method was chosen for this investigation because it can simultaneously handle serial mediation Nitzl, Roldan, and Cepeda (2016) and HORF constructs Cheah, Roldán, Ciavolino, Ting, and Ramayah (2021) in a comprehensive framework. PLS-SEM is the appropriate option for this research's data analysis because the researcher provided the SAP as a HORF component, which helped to develop a comprehensive framework (A. 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 as the analysis method. Measurement and structural model assessments were performed using SmartPLS software (v3.3.5) (Ringle, Wende, & Becker, 2015). A two-step method of data security were implemented by recommended (Hair Jr et al., 2017). 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; Khan & Roy, 2023). All λ values were above the threshold value of 0.70. A high level of internal consistency was demonstrated by the CR (> 0.7) and α (> 0.7)

values, and convergent validity was established by an AVE value of more than 0.50 (Hair Jr et al., 2017). The Fornell and Larcker (1981) and Heterotrait-Monotrait Ratio (HTMT) criteria were applied to establish discriminant validity. All HTMT ratio scores fell short of the 0.85 conservative cut-off (Kline, 2023). The analysis shows that the investigation established the measurement model's convergent and discriminant validity, as shown in Table 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			

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 (in 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.

4.2 Assessment of Formative Construct

In this study, 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 a disjoint two-stage approach. In the 1st stage, the latent variable scores of the LOC were calculated. The scores from the PLS method were then 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 threshold (Hair Jr et al., 2017). The researcher used the bootstrapping method to evaluate the significance of the weights (taking 5000-resamples). The results show that the weights of all indicators were statistically significant ($p < 0.001$). The findings illustrate how the formative constructs contribute differently to the development of the HORF construct which the results are presented in Table 4.

Table 4. Results of 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

4.3 Assessment of the Structural Model

The structural model needed to be examined to confirm the proposed correlation once the measurement model was validated (Hair Jr et al., 2017; Roy, 2022). The researcher examined collinearity to ensure that there was no multicollinearity issue. The results revealed that the construct's VIF scores were significantly lower than 5. The structural model was evaluated using path coefficients (β), R^2, and Q^2, with Table 5 showing the results that confirm all direct hypotheses are supported.

There was 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 was a significant relationship

between ADVA and ATSA (β = 0.525, t = 13.998) and PINN (β = 0.359, t = 5.857). Furthermore, ATSA was 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), as illustrated in Figure 2.

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 Jr et al. (2017), using 5000 subsamples. The researcher employed the decision tree proposed 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 SAP to PINN. Furthermore, the serial mediation impact of ADVA and ASTA on the relationship between SAP and PINN was also significant (β = 0.142, t = 6.904). Therefore, H_{4a}, H_{4b}, and H_5 are supported. As shown in Table 5, SAP has a substantial direct impact on PINN (β = 0.176, t = 5.228, p < 0.001), which favors complementing partial mediation.

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

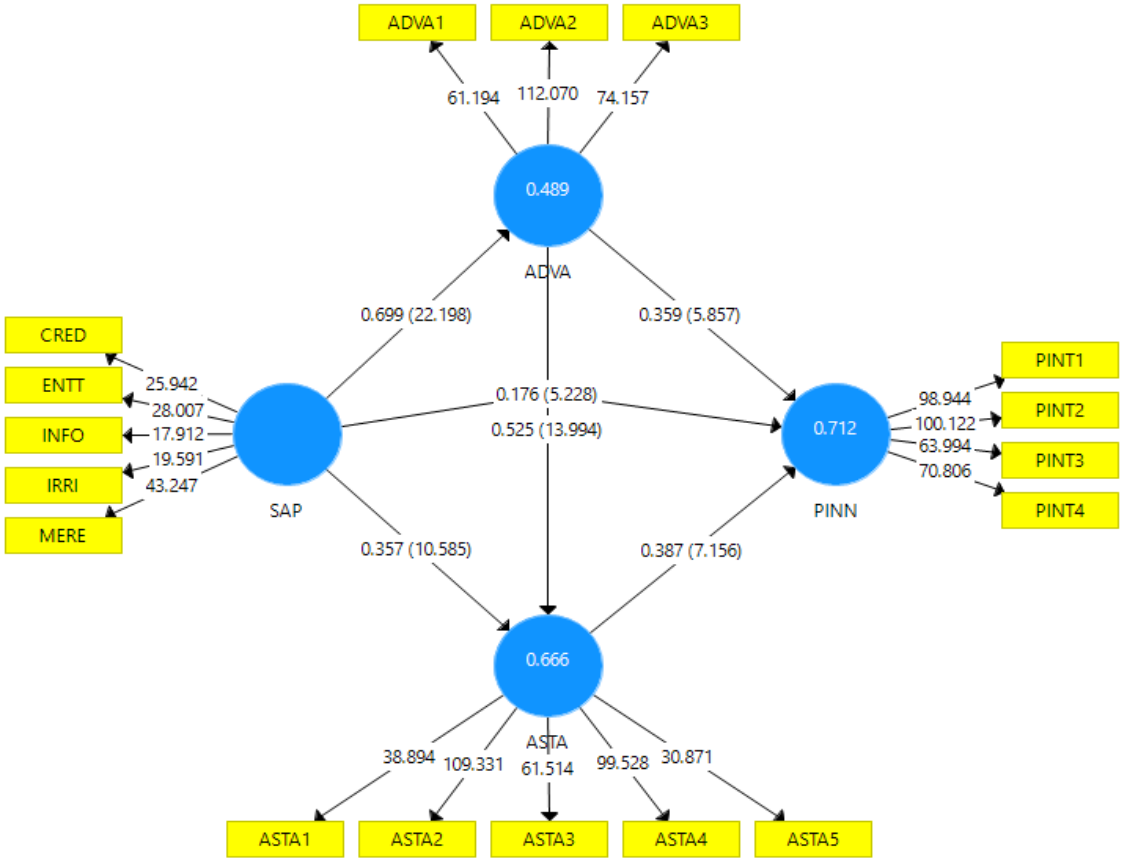

Figure 2. Results of the structural model

The figure 2 shows the results of the structural model using PLS-SEM, with latent variables represented by blue circles and indicators represented by yellow rectangles. The arrows between variables indicate relationships, with the path coefficients reflecting the strength of the relationships between variables (e.g., 0.489 between ADV1 and ADV2). The R^2 values within the blue circles indicate the extent to which the latent variables are explained by the model (e.g., R^2 for ADV1 is 0.699). The standardized coefficients represent the relative influence between the variables. This model illustrates the relationships between the constructs tested in the study.

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 to evaluate the adequacy of the structural model. 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 had significant explanatory power. Finally, SAP, ADVA, and ATSA have a significant explanatory capacity in the model by predicting 71.2% of the variation in PINN.

Moreover, according to the effect size, with a medium effect size, ATSA ($f^2 = 0.173$) was the most vital PINN predictor. Similarly, ADVA ($f^2 = 0.161$) had a medium effect size, and SAP ($f^2 = 0.046$) had a small effect size for predicting PINN (Cohen, 2013). In the final stage, the predictive significance was assessed using the Stone-Geisser Q^2 (Stone, 1974). The Q^2 values were greater than 0 for every exogenous construct (ADVA = 0.483, ATSA = 0.522, and PINN = 0.495), indicating the strong predictive relevance of the model (Chin et al., 2020). The results revealed increased consistency in the model's predictive ability, with Q^2_predict scores being greater than Q^2 scores, as presented in Table 6.

Table 6. 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: Q2 values represent (0.02 = Small; 0.15 = Medium; 0.35 = Large) predictive relevance.

4.6 Results of the Neural Network (NN)

Artificial neural network (ANN) modeling is a popular machine-learning technique employed in many academic disciplines. For example, mobile commerce Chong (2013) and mobile banking services (S. K. Sharma et al., 2019). An ANN is described by Haykin (1994) 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 attempts to simulate the functioning of the human brain. Through training, ANN reveals the hidden correlations in the given dataset, and testing illustrates how the learning is applied. Because ANN is devoid of assumptions about multivariate data distribution, it can be used to examine complicated associations (Chong, 2013). Compared to conventional statistical techniques, such as SEM or regression, ANN offers a substantial advantage. ANN can assess nonlinear 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). The ANN model used in this study was trained using a widely employed feed-forward back-propagation multilayer training technique (A. Sharma et al., 2021). The input and hidden nodes were implemented using multilayer perceptron and sigmoid activation algorithms (S. K. Sharma & Sharma, 2019). This study employed a 10-fold cross-validation approach to prevent overfitting, which is an issue with ANN. Network computing node research does not contain heuristics (A. Sharma et al., 2021). Consequently, this study employed the commonly used Root Mean Square Error (RMSE) to confirm the ANN evaluation results, as recommended by many researchers (Chong, 2013; A. Sharma et al., 2021). In this study, training was performed with 90% of the data points, while testing was performed with the remaining 10% (Leong, Jaafar, & Ainin, 2018).

In the present study, ANN analysis utilized only one model. As shown in Figure 3, the input layer (neurons) of the ANN model included SAP, ADVA, and ATSA, whereas the output layer included PINN. The RMSE represents the training and testing errors. Table 7 presents the RMSE assessment, showing that the average RMSE scores for the training and testing operations are 0.072 and 0.066, respectively, both of which are quite low. Consequently, the researcher affirms that the model fits perfectly and that the ANN analysis findings are entirely trustworthy (Chong, 2013; A. Sharma et al., 2021).

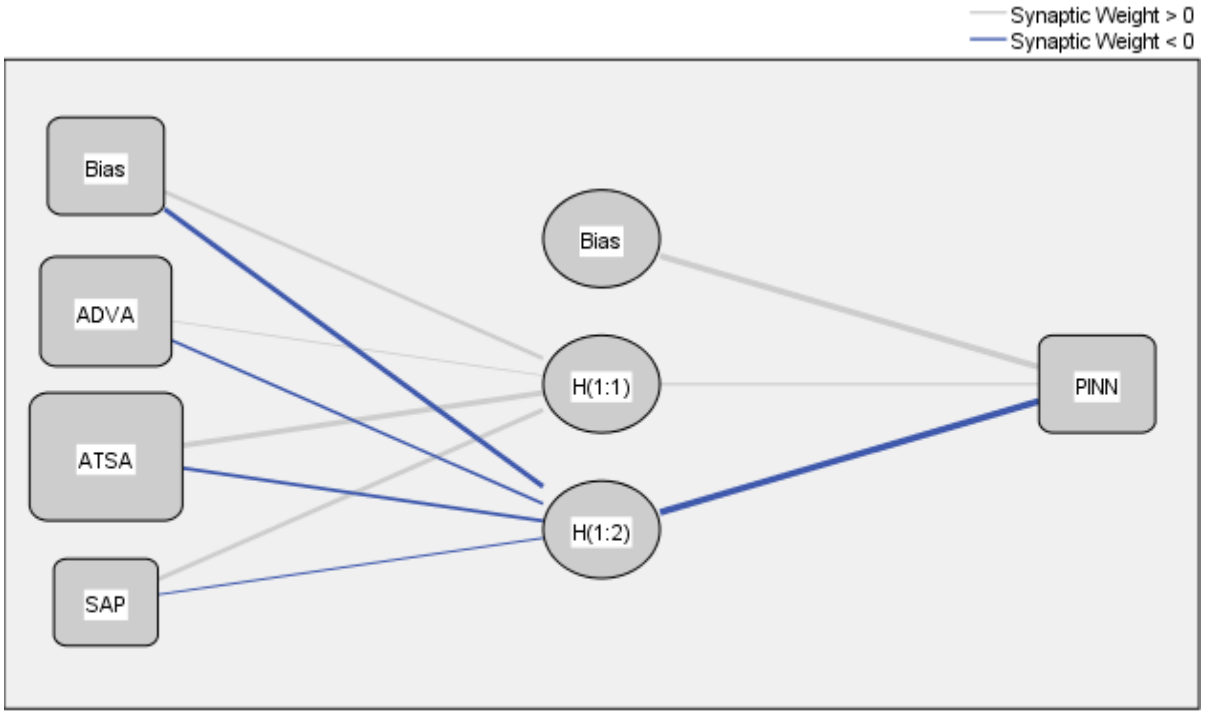

Figure 3. ANN architecture

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***	

4.8 Sensitivity Analysis

According to modifications in the independent factors linked to the dependent variable, a sensitivity analysis in a framework establishes how the dependent variable can vary. The relevance of SAP, ADVA, and ATSA in predicting PINN was averaged in the current investigation to obtain the result Chong (2013), as shown in Table 8. From the ANN analysis, ATSA was 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 ANN findings, the

researcher can infer that 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%**

4.9 Discussions

The main goal of this study was to ascertain the process through which SAP influences the PINN of young consumers. Employing a multi-analytic methodology, this was accomplished using hybrid PLS-SEM-ANN modeling. This study examined the direct effects of SAP on ADVA, PINN, and ATSA; ADVA on PINN and ATSA; and ATSA on PINN, with all direct hypotheses being supported. These findings imply that SAP significantly improved ADVA, PINN, and ATSA. Moreover, ADVA has significant impacts on ATSA and PINN, and ATSA positively affects PINN. This new evidence improves our understanding of how SAP influences PINN. The results of the present study 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 findings of this study also support the hypothesis that ADVA causes the development of ATSA and PINN. Previous investigations Martins et al. (2019), A. Sharma et al. (2021) have confirmed this association and explained how ADVA significantly affects the correlation between PINN and ATSA. The findings of this study show that SAP, ADVA, and ATSA are essential predictors of the PINN.

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

Although all factors that predicted the PINN were significant, it was unclear how they were related to the PINN. Therefore, ANN modeling was used to rank the predictors of PINN. Similar to the PLS-SEM results, the outcomes of the ANN also revealed that ATSA is the most pertinent predictor of PINN.

4.9.1 Theoretical Implications

The conclusions of this study have a wide range of theoretical implications. First, this study proposes a model for mobile advertising that explains how SAP affects PINN using the SOR framework in the Bangladeshi environment. Second, this study determined that SAP is a type 2 HORF construct and tested it. The subdimensions of SAP include INFO, ENTT, CRED, MERE, and IRRI. These outcomes support the HO specification of the SAP construct. This study significantly contributes to the advertising literature by detailing how SAP sub-dimensions interact. 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 study aims to bridge this gap. This study augments the frame of knowledge on mobile advertising by describing the link between these parameters. The work has been done on the method by which the impact of SAP is communicated to PINN, which 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 model used in this study, 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 advertising strategies. The findings of this study indicate that each of the five identified SAP aspects is significant. However, the enormous contributions to SAP creation came from MERE and ENTT, followed by IRRI, CRED, and INFO. Therefore, 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 aids in future brand recall and promotes the intent to buy the brand. By disclosing accurate, trustworthy, and reliable information about a brand's products, SA must exemplify CRED.

The study also revealed a significant positive association between SAP and ADVA, ATSA, and PINN. The strongest connection was between SAP and ADVA, followed by ATSA and PINN. Previous research on customer behavior has demonstrated that unfulfilled expectations and requirements are the basis of ADVA. Therefore, 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 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 for different customer bases. Thus, this study contributes fresh perspectives to a topic that has received little attention. This study boosts the SOR model by recognizing vital mediating variables that aid in realizing how ADVA, ATSA, and PINN are inclined by SAP. It advances the researcher's explanation of the correlation between these constructs. As a result, marketers and marketing companies can create plans to efficiently optimize the use of SA in sponsoring their products in the commercial marketplace, thereby maximizing the influence of marketing on the PINN of millennial consumers.

Eventually, all forms of advertising, including mobile advertising, may benefit from the study's conclusions. The justification is that most 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 should not be understated. These platforms rely on technology, are generally incompatible with one another, and use Internet access (Tseng & Teng, 2016). In contrast, SA does not need to meet these criteria. Without these constraints, SMSs may be used as a direct interface to communicate with clients, increasing the likelihood of a quicker response.

5. Conclusions

5.1 Conclusion

In this study, the SAP HO construct was suggested and verified. Using the SOR architecture, this study illustrates the effect of SAP on PINN. The SOR framework-based hypothesis of this study states 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 results provide evidence in favor of all direct and indirect assumptions. By illuminating how SAP, ADVA, and ATSA affect PINN, the results add to the advanced knowledge in the mobile advertising area.

5.2 Limitations

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

5.3 Suggestions and Directions for Future Research

Future studies may utilize longitudinal data 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 to comprehend ADVA and ATSA more thoroughly. Examining the applicability of the comprehensive model suggested and proven in this study to other advertising mediums, such as video app advertising, is a robustly advised future research direction. Innovative data analytics methods, such as artificial intelligence and machine learning, should be employed to obtain more detailed findings and recommendations.

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Author Contributions

SKR was responsible for conceptualization, study design, data collection, data analysis, manuscript drafting, revision, supervision, and final approval of the manuscript. The author has read and approved the final version of the manuscript and agrees to be accountable for all aspects of the work.

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