

**A CROSS-SECTIONAL DESCRIPTIVE STUDY OF THE COGNITIVE AND AFFECTIVE FACTORS TOWARDS THE ONLINE SHOPPING DECISION MAKING ABILITY OF INDIAN ONLINE CONSUMERS: AN ARTIFICIAL NEURAL NETWORK (ANN) APPROACH**

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### **Abstract**

*This study aims to explore the best predictors of online shopping decision making ability (OSDMA) between cognitive factors (CF) and affective factors (AF) amongst the Indian online consumer. The influence of the independent variables (cognitive and affective factors) on the dependent variable (online shopping making ability) is checked using two hypotheses. The data was collected using web-based structured questionnaire. The sample size was 600 respondents. The enter method and stepwise regression were used to generate linear models. Artificial neural network (ANN) analysis, a machine learning algorithm was employed in the research to generate nonlinear model. Data was analyzed using SPSS 23.0. The study finally concluded that affective factors is the best predicting factor towards the online shopping decision making ability.*

**Keywords-** Online Shopping Decision Making Ability; Cognitive Factors; Affective Factors Regression Analysis-Enter Method, Artificial Neural Network (ANN)

### **1. Introduction**

The online shopping behavior is based on the various factors like cognitive factors, affective factors and online shopping decision making ability factors. The cognitive factors are emotions and sentiments whereas the online shopping decision making ability factors are scanning ability, interpretation ability, and action ability. The cognitive factors, affective factors are the independent latent variable, whereas online shopping decision making ability factors are the dependent latent variable in this study. The cause-and-effect relationship using regression analysis – enter method among cognitive factors, affective factors and online shopping decision making ability factors are checked for the Cross-Sectional Descriptive of online shopping behavior of Indian consumers. The emotions, sentiments, scanning ability, interpretation ability, and action ability play a vital role in the online shopping decision making. These closed linked and intermingle variables are tested using Regression analysis-enter method, and Artificial Neural Network (ANN) approach. Cognitive factors, such as perception, knowledge, and attitudes, influence how Indian consumers make decisions when shopping online. These factors can shape their preferences, expectations,

and overall satisfaction with the online shopping experience. Perception plays an important role since it influences how consumers interpret and evaluate online shopping platforms, product descriptions, and customer reviews. Positive perception can lead to increased trust and likelihood of making a purchase. Knowledge about online shopping, such as understanding security measures, payment options, and return policies, can significantly impact decision-making. Consumers with more knowledge are likely to make informed choices and feel more comfortable shopping online. Attitudes towards online shopping, including trust in e-commerce platforms, perceived risks, and convenience, can shape the behavior of Indian consumers. Positive attitudes can lead to increased online shopping behavior, while negative attitudes can deter consumers from making online purchases. Additionally, factors like website design, user experience, and personalized recommendations can further influence decision-making ability and online shopping behavior. A well-designed and user-friendly website can enhance the overall shopping experience and encourage consumers to make more purchases. It's important to note that individual preferences and cultural factors may also come into play when examining the online shopping behavior of Indian consumers. Understanding these factors can help businesses tailor their strategies and offerings to better meet the needs and preferences of Indian online shoppers. Understanding the nature of the difficulties requires extensive reading. It provides a thorough overview of all elements of study fields, new discoveries, and technique. The researcher may learn about the many sorts of research designs and research techniques. The preceding literature was researched using Google Scholar, the J-Gate portal, an online library, and other reputable national and international journal sources. For examining past literature in the APA (American Psychological Association 7th edition) referencing style, the Mendeley desktop and reference manager were utilized. The previous authors findings about online shopping behavior under the background of neuromarketing phenomena are as follows: A marketing strategy cannot completely erase or obstruct a customer's capacity to make choices. There are some doubts about neuromarketing as well. While using technology in market research is beneficial, others argue that clicking a purchase button removes all of the consumer's freedom of choice. Customers' thinking brain processes will be completely wiped, and human robots trained to respond to marketing stimuli will be constructed in their stead. In other cases, people may be transformed into pre-programmed shopping machines geared to consume certain things. Neuromarketing is becoming more popular among organizations, and more are using its services. **(A. Sharma et al., 2023)** Neuromarketing is an intriguing field that has the potential to alter consumer decision-making by using neuroscience methodologies to examine the unconscious mechanisms that influence consumer behaviour. Despite challenges like standardization and ethical concerns, neuromarketing has the ability to improve marketing strategies and ethical business practices. Businesses may create products that meet customer expectations by focusing on individual demands and preferences. Neuromarketing may assist organizations in meeting customer needs and gaining a competitive advantage in the market. **(Misra, 2023)** Customers' impressions of reconditioned things may be impacted by their familiarity with the product's history. Customers were shown to be more likely to purchase a remanufactured product if they were aware of the product's

resemblance to new products as well as the cost. It is yet unclear how information about various sorts of refurbished products influences consumer selections. In this study, we use an integrated research model based on complexity theory to assess the influence of various types of product information on customers' buying decisions for remanufactured products. **(Alyahya et al., 2023)** The Indian market is expanding, but monitoring consumer purchasing behaviour remains difficult. Marketers confront difficulties as a result of unexpected customer behaviour and market volatility. This research validates the usefulness of Natural Language Processing (NLP) in analyzing consumer behaviour by investigating components such as Social (SC), Attention (A), Technology (T), and Emotion (E) to predict purchasing behaviour. **(Traymbak et al., 2023)** Neuromarketing is a rapidly expanding discipline that use neuroimaging technology to investigate customers' behavioural reactions to particular marketing-related stimuli, as well as innovative marketing tools that might supplement classic ones such as surveys. In this regard, the current research offers a multimodal Neuromarketing dataset including data from 42 people who took part in an advertising brochure-browsing scenario. In greater detail, participants were shown a succession of supermarket brochures (each displaying a different product) and directed to choose the things they wanted to purchase. For each person who followed this procedure, the following data was collected: (i) encephalographic (EEG) recordings, (ii) eye tracking (ET) recordings, (iii) questionnaire answers (demographic, profile, and product-related questions), and (iv) computer mouse data. Because of the scarcity of available relevant datasets, the NeuMa dataset presents new and unique chances for academics in the area to take a more holistic approach to neuromarketing. **(Georgiadis et al., 2023)** In an e-commerce scenario, website design has no discernible association with consumer e-retention. According to the findings, e-retention is dependent on the amount of trust, which is measured by engagement connections with webstores. Customer e-trust and e-retention in online buying were shown to have a favourable and substantial effect on dependability. This indicated that error-free transactions, as well as adequate security assurance, increase the reliability of online stores, which strengthens positive engagement ties, as online customers perceive lower risks in terms of delivery, payment, information breaches, and so on with online retailers when compared to traditional retailers. As a result, online shoppers may choose to do business with online sellers that they believe to be trustworthy. There is a considerable association between perceived ease of use and online shopping retention. According to U&G theory, convenience is another motivator for consumers to remain with the webstore for an extended period of time. **(Saoula et al., 2023)** Colour has a crucial role in influencing client buying behaviour, eliciting emotions, and shaping perceptions. To obtain a competitive advantage, businesses must comprehend the impact of colour on their target audience. Colours that connect with corporate values and trigger desired emotions are crucial for marketing success. The T-value for these statements is less than 0.05. **(P. K. Singh et al., 2023)** The human mind is crucial in determining if a product is appropriate for people. Colour, symmetry, and branding all have an influence on the attractiveness of a product. Because people seek out viewpoints via reviews and comments, online influence is more effective. The pandemic has exacerbated this trend, with social media playing a big role in online persuasion. However, more research is needed to understand

how psychology influences product decision-making. **(Joshi, 2022)** The brain plasticity that guides the human being will be present once more in this post-pandemic period, adapting needs, desires, and purchasing processes, where stimuli provided by real people, the projection of social comfort, brand attentional capacity, involvement in collective purposes, or even the digitalization of the simplest or most complex daily path will be CB drivers. Companies must therefore maintain an engaging, quick, and continuous purchase process across all channels, as well as surprise customers with genuine, new, and immersive experiences, allowing beliefs to grow and be solidified, and boosting consumers' inclination to repeat the habit. **(Veiga & Diogo, 2022)** Attention, memory, ideation, emotion, and sentiment all have an impact on strategic decision-making. Five factors impact strategic decision-making. Learning how to interact with others is critical for personal growth and professional connections. Entrepreneurs with exceptional cognitive abilities may develop a large, high-quality social network in order to sell their company and reach peak performance. **(Feng et al., 2022)** Because colour attracts clients, commercial companies should focus on individual needs and product presentation. Neuromarketing assists in the detection of customer preferences and decision-making. Provide more product information and use caution when selecting price. Examine client behaviour and use neuromarketing strategies to address marketing problems and improve product packaging. **(Ismajli et al., 2022)** Consumers' online purchasing habits are significantly impacted by their trust in a particular website, the ease with which they utilize the internet, and the services provided by e-tailers. The poll also showed that the online purchase patterns of rural clients differed from those of metropolitan consumers. E-tailers should pay particular attention to the personal information they seek from clients and provide them with suitable product information. Rural and urban customers have diverse preferences and must be treated accordingly. **(A. Singh et al., 2020)** Neuromarketing is a revolutionary concept that focuses on creating fresh material in order to better understand and analyse consumer psychology. Because we do not fully understand the capability of the human brain, no one technology has been able to get comprehensive information of this potential. It is not a replacement for traditional marketing efforts, but rather a concept to be used in combination with current methods to get a better knowledge of a consumer's behaviour on certain subjects. Although neuromarketing provides insight into a customer's continual judgements, it is still vital to comprehend the explicit choices that the brain makes that drive consumer attraction to a brand. **(Kari et al., 2020)** A product's rejection rate surpasses its purchase rate. This is particularly true for today's discriminating shoppers. Traditional marketing is killing businesses, which means they can no longer captivate customers with magnificent advertising or even celebrity endorsement. As they collect information and peek around corners, customers will uncover the true face of the things or companies. Furthermore, few companies understand how to customise their advertisements depending on the information they get from each customer. Companies who use such information to appropriately target their customers will succeed in the market. **(Narayanan & Raj, 2020)** Neuromarketing provides various benefits over traditional marketing strategies. Neuromarketing is a discipline that promotes adding value to marketing research and encourages organizations to use result-oriented marketing inputs. Neuromarketing's expansion as a scientific idea aids in the

improvement of quality and consumer understanding. The study gives information on the use of neuromarketing in consumer advertising in online buying. The results may help the researchers to broaden their investigation into the impact of Neuromarketing on consumer perceptions. According to the research, a successful marketer must have a positive customer perception and establish a brand image. **(S. Singh, 2020)** Many new marketing tactics are emerging in the contemporary climate, but the need remains the same: to meet customers' needs and aspirations. India is a varied country in every sense. One set of ideas has minimal sway on others, but it has an impact on a certain society. When large Bs can contribute, it attracts considerable investment; otherwise, it does not. Few people will oppose to men's inner awareness being tested. This software has still another function. However, there was little doubt that neuromarketing would pave the way for new goods and consumer advantages. **(Nagalatha, 2018)** Neuromarketing may help marketers, psychologists, and economists better understand consumer preferences and behaviours. It provides a quick reaction to marketing stimuli, making this strategy more desirable to large corporations. Neuromarketing gives a more in-depth understanding of how messages are seen and processed, as well as insights on corporate sustainability and connections to other aspects. As it evolves, it will reveal intricacies impacting consumer behaviour, allowing for the development of customer-pleasing products and services. However, privacy and moral concerns remain, and researchers must prioritize consumer rights and interests. **(Devaru & Devi, 2018)** Neuromarketing is a cutting-edge technology that studies people's brain processes and changes during decision making in attempt to predict consumer buying behaviour. Over 90% of decisions are made subconsciously and illogically. According to the conclusions of this study, neuromarketing has a significant impact on consumer purchasing decisions. It is a potent marketing approach used to assess and predict consumer likes and preferences. **(Bhandari, 2018)** Online purchasing has gained in popularity over the last decade. This service is very useful and is widely utilized by the "Net- Generation." Although online shopping may be very convenient and lucrative, it can also pose some complications. Consumers have been seen to demonstrate unique purchase behaviours while shopping online vs in traditional retail places. Statistical methods were utilized to determine that there is no statistically significant difference between male and female management students at Jaipur National University in Jaipur (Raj.). This underlines the need of merchants observing consumer behaviour and making changes in order to remain profitable and grow. Overall, the results show that respondents favoured online purchasing. This undoubtedly contributes to the growth of the internet shopping industry. Various businesses may also use statistics to establish their target customer demographics. Online commerce has a promising future in India. **(Kala, 2015)** Online purchasing is becoming more popular among the younger population. Higher-income and more educated consumers are making more purchases via e-commerce platforms. People are hesitant to purchase online owing to security worries. At the same time, many are hesitant to change due to the technical complexity of online purchasing. Companies engaging in online commerce should prioritize the development of trustworthy relationships between producers and consumers. **(Kanchan et al., 2015)** There is a strong link between perceived risk and attitude toward online purchasing, while the other three hypotheses, namely that there is no

significant relationship between online shopping and reported joy, ease of use, or usefulness, have been rejected. Out of the four factors, perceived risk is the most influential in influencing consumers' online purchasing behaviour in Delhi. Customers' perceived risk indicates a lack of trust, as well as a number of other elements such as the likelihood of being duped, inferior product quality, non-returnable policy, and so on. (Jain et al., 2014) . Based on the literature review, the research gaps were identified as there were very little studies on the Online consumer behavior using Artificial Neural Network. This study explored the cross-sectional descriptive study of the Cognitive and Affective factors Towards the Online Shopping Decision Making Ability of Indian Online Consumers; hence the specific objectives of this research are formulated as follows:

- To find the effect of Cognitive Factors on the Online Shopping Decision Making Ability of Indian Online Consumers.
- To find the effect of Affective Factors on the Online Shopping Decision Making Ability of Indian Online Consumers.
- To find the best predictors of Online Shopping Decision Making Ability between Cognitive and Affective Factors Indian Online Consumers using Artificial Neural Network (ANN) Approach.

## 2.0 Background context

This section highlights the review of literature of the selected constructs for exploring the adoption intention of IoT in banks and other financial institutions.

### 2.1 Cognitive Factors (CF)

Under the Cognitive Factors (CF) construct, the following statements were used to measure the cognitive construct as 1. "I feel excited and enthusiastic when shopping online." 2. "I experience a sense of convenience and ease while shopping online." 3. "I feel satisfied with the overall online shopping experience." 4. "I trust online platforms to deliver quality products and services." The first null hypothesis was formulated as

*H01: There is no significant effect of Cognitive Factors on the Online Shopping Decision Making Ability of Indian Online Consumers.*

### 2.2 Affective Factors (AF)

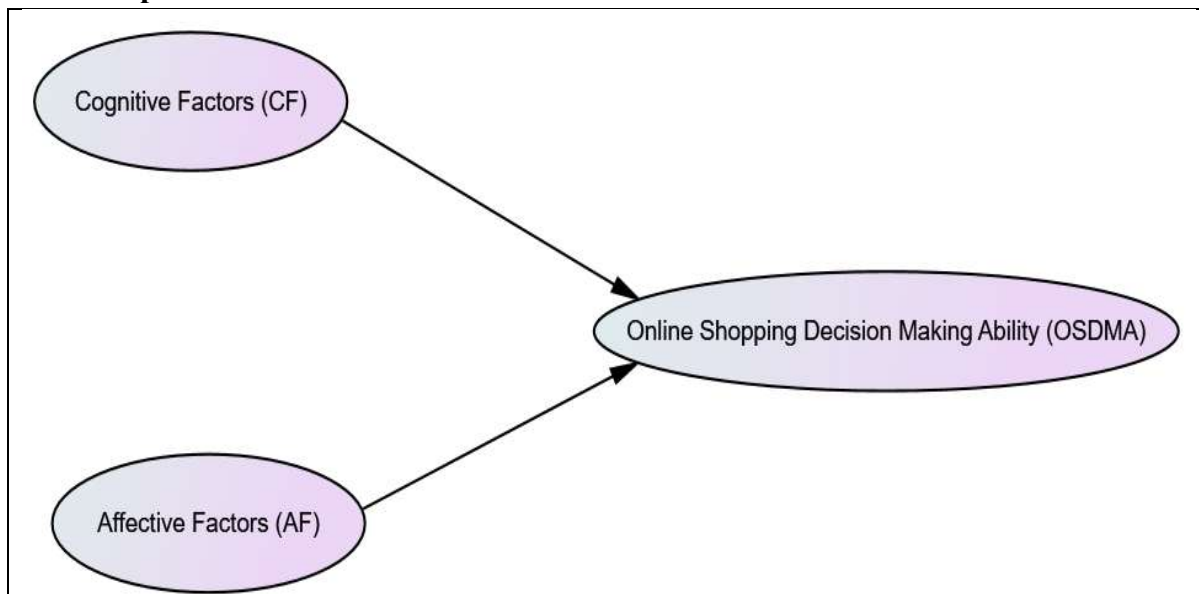
Under the Affective Factors (AF) construct, the following statements were used to measure the cognitive construct as 1. The overall experience of shopping online in India excites me. 2. I feel a sense of trust and security while making online purchases in India. 3. The convenience of shopping online in India positively influences my mood. 4. The availability of a wide range of products online in India enhances my shopping experience. 5. I enjoy the personalized recommendations provided by online platforms in India. The second null hypothesis was formulated as

*H02: There is no significant effect of Affective Factors on the Online Shopping Decision Making Ability of Indian Online Consumers.*

### 2.3 Online Shopping Decision Making Ability (OSDMA)

Under the Online Shopping Decision Making Ability (OSDMA) construct, the following statements were used to measure the cognitive construct as Online Shopping Decision Making Ability construct was measured under following points as 1. I feel confident in making online shopping decisions. 2. I thoroughly research products before making a purchase online. 3. I consider multiple options and compare prices before buying online. 4. I trust online reviews and ratings in making my purchasing decisions. 5. I rely on recommendations from friends and family when shopping online. 6. I feel comfortable navigating through various online shopping platforms.

### 3.0 Conceptual Research model



**Figure 1:** Conceptual Research Model

The figure depicts the dependent latent variable Online Shopping Decision Making Ability (OSDMA) was considered as dependent latent variable. Independent Latent Constructs- Cognitive Factors (CF), Affective Factors (AF),

Figure 1 shows there are two latent independent latent variables, each having four and five items respectively items. Ine dependent latent variable having six items. Independent Latent Constructs- Cognitive Factors (CF), Affective Factors (AF), and Dependent variable- Online Shopping Decision Making Ability (OSDMA).

**Table 1:** Constructs, item codes, and description

Construct/variable	Item code	Item description
Cognitive Factors	CF1	1. "I feel excited and enthusiastic when shopping online."
	CF2	2. "I experience a sense of convenience and ease while shopping online."
	CF3	3. "I feel satisfied with the overall online shopping experience."

	CF4	4. "I trust online platforms to deliver quality products and services."
Affective Factors	AF1	1. The overall experience of shopping online in India excites me.
	AF2	2. I feel a sense of trust and security while making online purchases in India.
	AF3	3. The convenience of shopping online in India positively influences my mood.
	AF4	4. The availability of a wide range of products online in India enhances my shopping experience.
	AF5	5. I enjoy the personalized recommendations provided by online platforms in India.
Online Shopping Decision Making Ability	OSDM A1	1. I feel confident in making online shopping decisions.
	OSDM A2	2. I thoroughly research products before making a purchase online.
	OSDM A3	3. I consider multiple options and compare prices before buying online.
	OSDM A4	4. I trust online reviews and ratings in making my purchasing decisions.
	OSDM A5	5. I rely on recommendations from friends and family when shopping online.
	OSDM A6	6. I feel comfortable navigating through various online shopping platforms.

Note- Constructs/ latent variables with its description of items, Sources Table 1 explains all the latent construct and its item code with description.

## 4.0 Methodology

### 4.1 Data gathering process

To obtain the data, we have used a web-based questionnaire. The sample size for this study was 600 respondents drawn from the Online Indian Consumers within 6 months duration in the year 2022. The non-probability snow ball sampling method was used for the study. This sampling strategy was used to allow respondents from various genders, educational backgrounds, and ages to be included in the sample.

### 4.2 Measures

Cognitive Factors (CF) having four items whereas Affective Factors (AF) having five distinct items. Online Shopping Decision Making Ability (OSDMA) having six items. All these factors and their dimensions/items are on five-point Likert scales from strongly agree, agree, neutral, disagree and strongly disagree. Four demographic variables, gender, marital status, age, and education were also included in the questionnaire. (See Table 1). The data analysis was done with the aid of IBM SPSS 23.0 version statistical software.

### 4.3 Analysis Models



This study used the two methods as enter method, and non-linear artificial neural network analysis to validate, address the hypotheses, and predict the best predictors of Online Shopping Decision Making Ability (OSDMA) in the online Indian consumers. The limitation of first models requires the normality and linearity condition whereas the ANN works on non-normal and non-linear data. These methods also helped in identifying the most important factor/factors that affect the Online Shopping Decision Making Ability (OSDMA) amongst the Indian Online consumers. The novelty of this research was to check the validity of results of two models in predicting the Online Shopping Decision Making Ability (OSDMA). The brief description of each method are as follows:

#### *4.3.1 Enter method regression analysis*

In the regression analysis- enter method, all the independent variables all included to check its effect on the dependent variable. In this method, the results may be significant or insignificant.

#### *4.3.2 Artificial neural network (ANN)*

The existence of non-linear relationships among the exogenous variables and the endogenous variables is one of the justifications for employing the ANN. Another justification is the non-normal distribution of the data. In addition to this, the ANN is resilient in the face of noise, outliers, and limited sample sizes. It is also able to accommodate non-compensatory models, in which a decrease in one factor does not necessitate an increase in another factor in order to compensate for the difference. The ANN algorithm is capable of capturing linear as well as nonlinear relationships, and it does not require normal distribution (Teo et al., 2015). The algorithm is able to learn through the training process to predict the outcomes of the analysis using a feed-forward-backward-propagation (FFBP) algorithm, in which the inputs are fed in a forward path and the estimated errors will move in a backward direction. FFBP is an abbreviation for feed-forward-backward-propagation. (Taneja & Arora, 2019) Input and hidden layers were both represented by multilayer perceptrons, and sigmoid activation functions were used (S. K. Sharma & Sharma, 2019). The number of mistakes can be reduced through the course of multiple iterations of the learning process, which also makes it possible to further enhance the accuracy of the prediction. (Idriss et al., 2019) The neural network module found in IBM's SPSS was used in the execution of the ANN analysis. In the analysis of ANN, we have followed the footsteps of (Liébana-Cabanillas et al., 2017) and used the significant factors that emerged from regression analysis as input neurons for the ANN model. In a manner that is analogous to that described by (Leong et al., 2018), we used 90% of the samples for the training procedure, while the remaining 10% samples were put to use for the testing procedure. A ten-fold cross-validating procedure, multilayer perceptron, ten epochs were carried out, and the root mean square of errors (RMSE) was calculated. This was done so that we could avoid the risk of overfitting the data (Ooi & Tan, 2016). When compared to SEM and Multiple Regression Analysis (MRA), which oversimplifies the complex decision-making process, neural network is one of the most standout techniques of artificial intelligence. It helps in identifying non-linear relationships of complex problems, which is a significant advantage over these other techniques. (Arif et al., 2020)

## **5.0 Results**

### *5.1 Reliability-Internal consistency, validity & non-multicollinearity*

**Table 2:** Reliability statistics & Principal components analysis results of CF, AF and OSDMA

Construct	Cronbach's Alpha	KMO Test	% of Variance	No. of Items	Results
Cognitive Factors (CF)	0.638	0.688	48.466	4	Acceptable
Affective Factors (AF)	0.786	0.759	54.059	5	Good
Online Shopping Decision Making Ability (OSDMA)	0.824	0.869	53.545	6	Excellent

Source: SPSS 23.0 output

It is clear that the Cronbach's Alpha value is 0.638 for Cognitive Factors (CF), which is low, but it is near to the acceptable value (0.700). Kaiser-Meyer-Olkin value is 0.688, which is above the preferable value (0.500). All the four items under the Cognitive Factors (CF) construct explain the 48.466% percentage of variance. It is also very clear that the Cronbach's Alpha value is 0.786 for Affective Factors (AF), which is high and above the acceptable value (0.700), and the Kaiser-Meyer-Olkin value is 0.759, which is above the preferable value (0.500). All the five items under Affective Factors (AF) construct explain the 54.059% percentage of variance. It is clear that the Cronbach's Alpha value is 0.824 for Online Shopping Decision Making Ability (OSDMA), which is excellent and above the acceptable value (0.700), and the Kaiser-Meyer-Olkin value is 0.869, which is above the preferable value (0.500). All the six items under the Online Shopping Decision Making Ability (OSDMA) construct explain the 53.545% variance percentage.

### 5.2 Enter method regression analysis results

**Table 3:** Variables Entered/Removed: Enter method regression

Model	Variables Entered	Variables Removed	Method
1	Affective Factors, Cognitive Factors <sup>b</sup>		Enter
a. Dependent Variable: Online Shopping Decision Making Ability			
b. All requested variables entered.			

Table 3 explains the number of variables used under enter method regression. In the enter method, two variables as Affective Factors, Cognitive Factors are taken independent variables and Online Shopping Decision Making Ability is the dependent variable.

**Table 4:** Model summary: Enter method regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.431 <sup>a</sup>	.186	.183	.73075	.186	68.100	2	597	.000
a. Predictors: (Constant), Affective Factors, Cognitive Factors									

Table 4 shows the Model summary. The value is  $R^2$  is 0.186 which means that, it explains 18.6 % of the variance. It is a moderate good model for selection

**Table 5:** ANOVA: Enter method regression

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	72.729	2	36.365	68.100	.000 <sup>b</sup>
	Residual	318.791	597	.534		
	Total	391.521	599			
a. Dependent Variable: Online Shopping Decision Making Ability						
b. Predictors: (Constant), Affective Factors, Cognitive Factors						

Note: ANOVA (Analysis of Variance): Enter method regression, \* $p < 0.05$

Table 5 shows ANOVA results. The  $F=68.100$  & Sig. Value  $p=0.000$ , which is less than 0.05. Hence, the model is significant.

**Table 6:** Coefficients<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Results Hypothesis
		B	Std. Error	Beta			
1	(Constant)	1.765	.127		13.858	.000	
	Cognitive Factors	.016	.058	.010	.276	.783	H01 Accepted
	Affective Factors	.454	.039	.430	11.549	.000	H02 Rejected
a. Dependent Variable: Online Shopping Decision Making Ability							

Note: \* $p < 0.05$ , H01 Accepted, H02 Rejected.

Table 6 shows the coefficient table, for Affective Factors, the p value (Sig value 0.000) is less than 0.05, which are significant. Whereas for Cognitive Factors, the p value (Sig value 0.783, ) is more than 0.05 which are insignificant at 5% significance level. Hence, first null hypothesis H01: There is no significant effect of Cognitive Factors on the Online Shopping Decision Making Ability of Indian Online Consumers is accepted whereas second hull hypothesis H02: There is no significant effect of Affective Factors on the Online Shopping Decision Making Ability of Indian Online Consumers is rejected. Therefore, it can be concluded that There is no significant effect of Cognitive Factors on the Online Shopping Decision Making Ability of Indian Online Consumers and There is a significant effect of Affective Factors on the Online Shopping Decision Making Ability of Indian Online Consumers.

### 5.6 ANN results

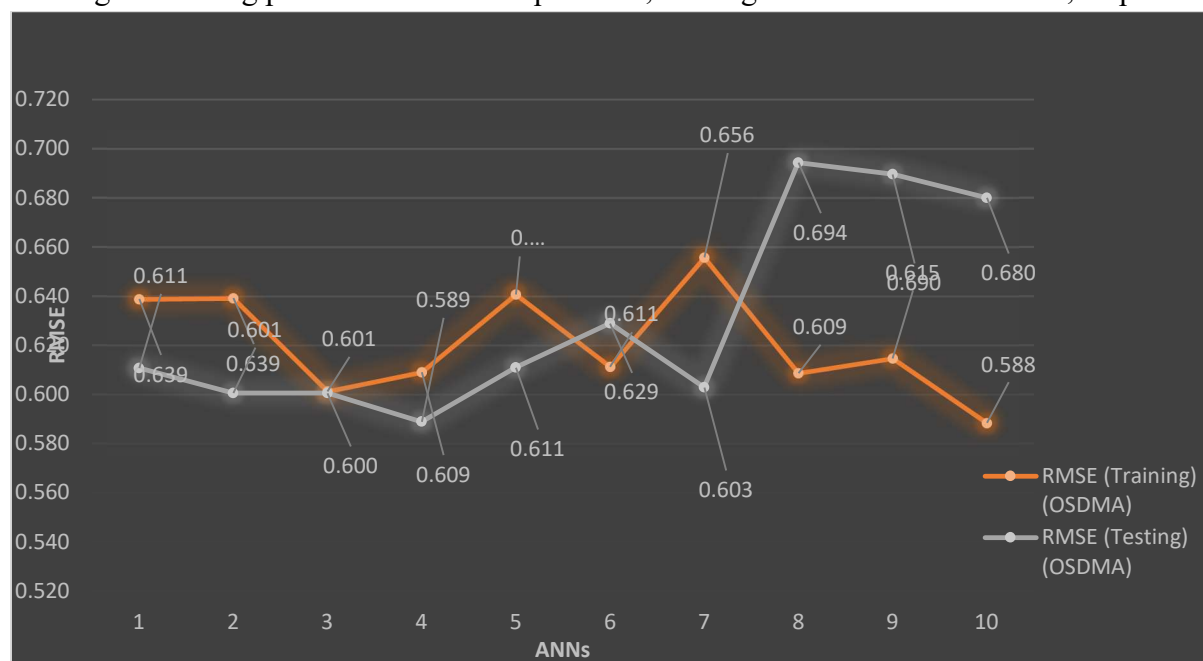
The results of the current ANN study are presented in Table 7 and Figure 3 represent the Line Graph of RMSE values.

**Table 7:** RMSE values

Net work	Sum of square error (Training) (OSDMA)	Sum of square error (Testing) (OSDMA)	RMSE (Training) (OSDMA)	RMSE (Testing) (OSDMA)
1	176.282	61.533	0.639	0.611
2	169.557	65.99	0.639	0.601
3	151.095	65.622	0.601	0.600
4	160.241	57.909	0.609	0.589
5	173.224	62.695	0.641	0.611
6	155.439	72.37	0.611	0.629
7	184.02	61.769	0.656	0.603
8	156.345	85.795	0.609	0.694
9	160.948	81.3	0.615	0.690
10	152.689	73.511	0.588	0.680
M	163.984	68.8494	0.6208	0.6308

Note: SSE=Sum square of errors, RMSE=Root mean square of errors, M= Mean

Table 7 shows the RMSE values with respect to Sum of square error (Training) (OSDMA), Sum of square error (Testing) (OSDMA), RMSE (Training) (OSDMA), and RMSE (Testing) (OSDMA). The mean values are also shown in the last row. The average RMSE values for the training and testing procedures are both quite low, coming in at 0.6208 and 0.6308, respectively.



**Figure 2:** Line graph of RMSE Values

Figure 3 shows the Line graph of RMSE Values (Training & Testing). RMSE (Training) (OSDMA) values are 0.639, 0.639, 0.601, 0.609, 0.641, 0.611, 0.656, 0.609, 0.615, and 0.588. RMSE (Testing) (OSDMA) values are 0.611, 0.601, 0.600, 0.589, 0.611, 0.629, 0.603, 0.694, 0.690, and 0.680.

**Table 8:** Sensitivity analysis

Construct	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	Total	Average	Rank
Cognitive Factors	37.00%	34.80%	59.60%	33.90%	25.30%	43.70%	35.70%	25.60%	56.40%	71.10%	423.10%	0.4231	2
Affective Factors	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	0.00%	1

Note: NI = Normalized Importance

Table 8 shows the sensitivity analysis, the Affective Factors is the best predictor for the Online Shopping Decision Making Ability among two predictors. The Cognitive Factors is the second-best predictor. Therefore, it can be finally concluded that Affective Factors directly influence the Online Shopping Decision Making Ability among the Indian Online consumers.

**Table 9:** Model comparison

Model Comparison	Order of Best Predictors of OSDMA	
	Affective Factors	Cognitive Factors
Enter-method regression analysis	1	2
Artificial Neural Network- ANN	1	2

Note- Model Comparison of four analysis analyses (1 represent as the best predictor and 2 is considered as second best)

Table 9 shows the model comparison. Therefore, applying all the two methods via the data sources, analysis or research methods employed in the current study and literature review, the Affective Factors have the maximum effect on the in the Online Shopping Decision Making Ability among the Indian Online consumers.

## 6.0 Discussion

### 6.1 Theoretical contribution

It has contributed to the existing literature about adoption intention of technology in various fields. The major contribution of this study is to understand the psyche of the online Indian customers while doing online shopping

### 6.2 Practical contribution

This study found that Affective Factors is the most important variable as per the customers points of view. Therefore, it will help the marketing organizations in designing the marketing plan and strategies. The findings of the study as a whole may be useful for the creation of a framework and service model for the implementation of best marketing strategies for customer understanding while doing online shopping. .

### **6.3 Limitations & future scope of the research**

The sample size and the urban sampling units are the limitations of this study. The future researchers can use the structural equation modelling and other approaches with different machine learning algorithms for rural consumers also across industries.

### **7.0 Conclusion**

The Affective Factors was found to be the most accurate predictor for the Online Shopping Decision Making Ability among the Indian Online consumers during the analysis. Cognitive Factors is the second-best predictor. The second factor namely Cognitive Factors are ranked at the second level respectively. As a consequence of this, one can arrive at the conclusion that the Online Shopping Decision Making Ability is directly influenced by Affective Factors as well as the Cognitive Factors. In all the two methods, that is enter regression, and ANN, the results are same. Thus, we can say that, Affective Factors have the strong evidence for the prediction of the best factors responsible for Online Shopping Decision Making Ability among the Indian Online consumers.

### **Declaration**

#### ***Conflict of interest***

The authors declare that they have no competing interests.

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