

# Impact of artificial intelligence on consumer behavior in reference to online shopping

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## Abstract

In recent years, consumers are finding it more convenient to use the technology based applications for online shopping and the other activities of their daily life. However, a limited amount of research has been done on artificial intelligence (AI) in online shopping apps and websites. The present paper examines the behavior intention of consumers to use AI enabled online shopping apps. The study is based on Technology Acceptance Model (TAM). In this quantitative research 232 responses were collected through online google form using convenience sampling. Structural Equation Modeling (SEM) using SEMinR package in R is used to analyze the data. It is found from this research that perceived ease of use impacts perceived usefulness and trust toward AI-enabled shopping apps and websites. Perceived usefulness significantly affect attitude. Trust positively impacts the perceived usefulness and attitude and attitude impacts behavior intention.

**Keywords:** *Artificial intelligence, Consumer behavior, Online shopping, SEM, SEMinR*

## 1. INTRODUCTION

Although artificial intelligence has been the subject of a lot of research since 1956[1], it has only lately resulted in the widespread deployment of intelligent applications for various domains and jobs [2]. The use of AI has increased in many areas including shopping apps and websites to make consumer's task easy. In views of consumers, purchasing products online is an easy way as it saves time too. While companies need information such as how consumers accept the AI enabled webshops or apps and how much they trust [3]. The goal of this research is to explore how AI impacts consumer behavior while doing online shopping. For this purpose, TAM model is used to study as how the elements of TAM like

perceived usefulness, perceived ease of use, trust affect the attitude and the behavior intention of consumers using AI enabled apps and webshops. Consumer's attitude, behavior intention and trust towards these apps for online shopping will help retailers to improve their services to justify consumers optimal use.

This paper follows the following structure: in the next section, a review of previous research is presented. Section 3 describes the research methodology. This section describes an overview of data collection method and analysis tools. The findings and analysis of this study are presented in Section 4 and Section 5 presents conclusion. Finally, the limitations and future research scopes are described in section 6 followed by references.

## 2. LITERATURE REVIEW

### 2.1 AI IN ONLINE SHOPPING

For the majority of consumers, buying products online has become a incredibly practical option. In recent years, due to technology advances, it has become more popular. Use of AI in shopping apps or web pages have attracted more consumers. People are now more comfortable and more familiar with the technology. With AI to offer more customized shopping route, the consumer's habits of doing online information search or product selection is explored in a better way [4]. It is pointed by [5], that AI and marketing is going to grow significantly in future. AI has become more important in marketing as it has increased the computing power, reduced the costs and uses advanced machine learning models [6]. The use of AI can increase the business as well as consumer satisfaction [7], [8] and [9].

**2.2 TAM**

The purpose of the TAM model was to comprehend how users accepted information systems. [10], see Figure 1. According to TAM, perceived usefulness and perceived ease of use determine attitude towards technology and attitude establish the intentions to use (BI) the same [10]. It is the most commonly used model to study the consumers' behavior in reference to adopting technology [11]. In past researches, the model has been used in the acceptance of different types of

information systems such as smart watch [12], business information system [13], intelligent health monitoring system [14], computer based assessment in higher education [15] and many other technologies. The present research paper applies TAM model to examine behavior intention (BI) to use AI enabled shopping apps with the factors perceived usefulness (PU) and perceived ease of use (PEU) and along with trust (T) and attitude (ATT). The theoretical model proposed for the present study is shown in Figure 2.

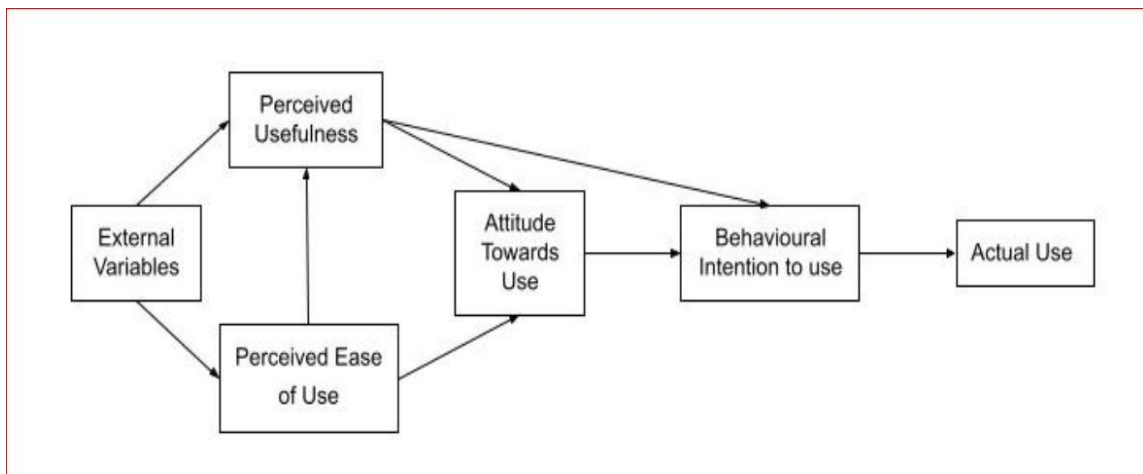


Figure 1 : The original Technology Acceptance Model (TAM) Source:[10]

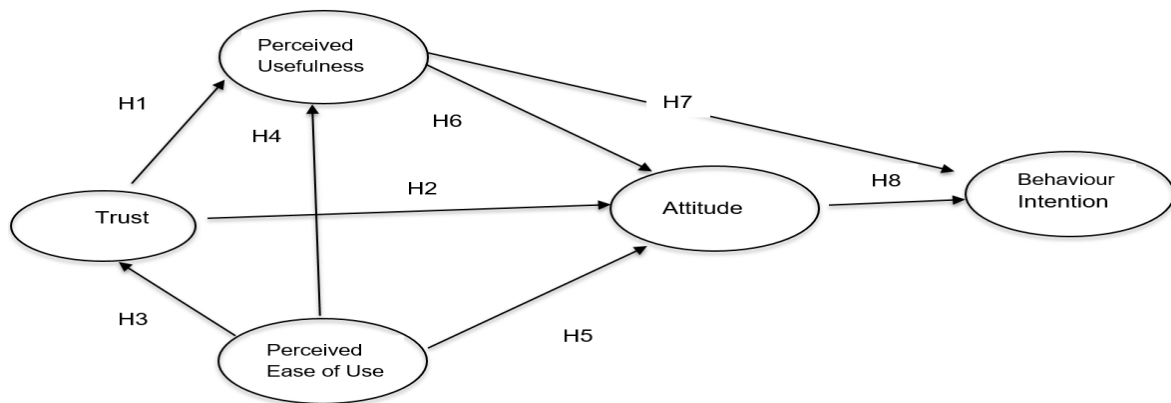


Figure 2: Proposed research model

**2.3 TRUST**

Trust was defined by [16] as "the belief that an Internet shopper has in an Internet merchant and is willing to engage in an Internet shopping transaction, even with the possibility of loss, based on the expectation that the merchant will engage in generally acceptable practices and will be able to deliver the promised product or services".

According to [17], for online store through website, it is necessary to promote trust between suppliers and customers if online trade is to remain prosperous. Hence, hypotheses H1 and H2 are as follows:

H1: Trust positively affects Perceived Usefulness.

H2: Trust positively affects Attitude.

## 2.4 PERCEIVED EASE OF USE

It is defined as “the degree to which a person believes that using a particular system would be free of effort”[10]. It has been found that perceived ease of use positively affects behavior intention (see e.g. [3] ). People having positive perceived ease of use intend to use the technology [18][19] [20] [10] Hence, in this paper, H3, H4 and H5 are as follows:

H3: Perceived Ease of Use positively affects Trust

H4: Perceived Ease of Use positively affects Perceived Usefulness.

H5: Perceived Ease of Use positively affects Attitude

## 2.5 PERCEIVED USEFULNESS

Perceived usefulness is the degree to which one believes that using the technology will enhance his/her performance (Davis et al., 1989). It is found to be one of the key factors responsible to impact the behavior intention to use AI enabled web shops and apps [3], [21]. Hence, in this research paper H6 and H7 are as follows:

H6: Perceived Usefulness positively affects Attitude.

H7: Perceived Usefulness positively affects Behavior Intention.

## 2.6 ATTITUDE AND BEHAVIOR INTENTION

“The degree to which a person has a favorable or unfavorable opinion or appraisal of the behavior in question is what is referred to as their attitude” [22]. It has been discovered that adoption attitudes are crucial for consumers’ acceptance of technology [20] , [23]. Positive attitudes toward behavior are formed when people think that behavior are connected to desirable results. The paper considers the following hypothesis on attitude and behavior intention.

H8: Attitude positively affects Behavior Intention.

## 3. RESEARCH METHODOLOGY

### 3.1 DATA COLLECTION

The data was collected using online survey form which was circulated among people through e-mail and whats app groups. For this quantitative research, the convenience sampling methods was used. A questionnaire containing the demographic characteristics given in Table 1 and 22 measurement items given in Table 2 was shared with the respondents in India. Total 232 responses were collected with no missing data. Approximately 60% of the respondents were male. 4 7% of the respondents were in the age group of 25 to 35 years, 19% were between 35 and 45 years of age, approximately 21% were between the age group of 45 to 55 years and the rest were of age 55 and more. People from different income groups had participated. Out of 232 respondents, 23.7% people were from the income group of Rs 25000 to Rs 40000 per month while 12.5% people were having income more than Rs 110000 per month. See Table 1 for details.

### 3.2 MEASUREMENT SCALE

A 5-point Likert scale, with 1 denoting strongly disagree and 5 denoting strongly agree, was used to measure the measurement items. The questionnaire contained 22 items: 4 of PU ( PU1, PU2, PU3, PU4) , 5 of PEU ( PEU1, PEU2, PEU3,PEU4,PEU5), 4 of T (T1, T2, T3, T4 ) , 5 of ATT (ATT1, ATT2, ATT3, ATT4, ATT5) and 4 of BI (BI1, BI2, BI3, BI4) adopted from [3] , [24] [25], [26] , [27], [19].

## 4. DATA ANALYSIS

After collecting the responses, data is analyzed using SEMinR package in R programming. SEMinR is a package for Structural Equation Modelling (SEM) [28] , [29]. The measurement model and the structural model are tested using SEM.

### 4.1 MEASUREMENT MODEL

Constructs’ quality is assessed by measurement model with factor loadings, construct reliability and validity.

#### 4.1.1 FACTOR LOADINGS

Table 2 shows the range of factor loadings is from -1.0 to +1.0 where higher values indicate a high correlation of the item with underlying factor [30]. It is recommended (see, [31] ) that the factor loading to be more than 0.5 and from Table 2, it can be seen that none of the items had factor loading less than 0.5 in the present model. See Table 2 for more details.

**Table 1: Demographic Characteristics of the Respondents**

Measurement Items	Frequency	Percentage
<b>Gender</b>		
Male	138	59.5%
Female	94	40.5%
<b>Age</b>		
25 to 35 years	109	47.0%
35 to 45 years	44	19.0%
45 to 55 years	48	20.7%
55 years and above	31	13.3%
<b>Monthly Income</b>		
Rs 25000 to Rs 40000	55	23.7%
Rs 40000 to Rs 70000	73	31.5%
Rs 70000 to Rs 90000	36	15.5%
Rs 90000 to Rs 110000	39	16.8%
Rs 110000 and above	29	12.5%

**Table 2: Loadings, Reliability and Validity**

Construct	Measurement Instrument	Loadings	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)	
			alpha	rhoC	AVE	rhoA
Perceived Usefulness	PU1	0.822	0.850	0.899	0.689	0.861
	PU2	0.853				
	PU3	0.804				
	PU4	0.840				
Perceived Ease of Use	PEU1	0.773	0.847	0.890	0.618	0.872
	PEU2	0.767				
	PEU3	0.816				
	PEU4	0.730				
	PEU5	0.841				
Trust	T1	0.736	0.856	0.902	0.698	0.869
	T2	0.883				

	T3	0.856				
	T4	0.857				
Attitude	ATT1	0.852	0.930	0.947	0.782	0.931
	ATT2	0.910				
	ATT3	0.893				
	ATT4	0.886				
	ATT5	0.878				
Behavior Intention	BI1	0.822	0.845	0.896	0.683	0.847
	BI2	0.839				
	BI3	0.825				
	BI4	0.819				

**4.1.2 RELIABILITY ANALYSIS:**

The degree to which a measuring instrument is consistent and stable is called reliability [32]. According to [33] , if the value of Cronbach’s alpha is high, it shows the items are highly consistent . The results in Table 2 indicate that alpha (Cronbach’s Alpha) for PU, PEU, T, ATT and BI are 0.850, 0.847, 0.856, 0.930 and 0.845 respectively. The composite reliability (rhoC) for PU, PEU, T, ATT , BI are 0.899, 0.890, 0.902, 0.947, 0.896 respectively and rhoA for PU, PEU, T, ATT, BI are 0.861, 0.872, 0.869, 0.931, 0.847.

For reliability, it is recommended that Cronbach alpha, rhoC and rhoA should be more than 0.7 [28]. Hence, all the constructs under study are reliable.

**4.1.3 CONVERGENT VALIDITY:**

Convergent validity is “the degree to which multiple attempts to measure the same concept are in agreement” [34]. The results in Table 2 show that AVE for the constructs PU, PEU, T, ATT and BI are 0.689, 0.618, 0.698, 0.782, 0.683 respectively. Fornell-Larcker criterion [35] states that the Average Variance Extracted (AVE) should be greater than 0.5 for convergent validity [31]. As for every construct, AVE is more than 0.5, this establishes the convergent validity.

**4.1.4 DISCRIMINANT VALIDITY:**

“Discriminant validity is the extent to which measures of different variable or constructs are distinct from each other”. Hence, if two constructs are truly different from each other, then their measures should not be strongly correlated with each other [34]. The Cross loading approach is

used in this research to assess the discriminant validity. Table 3 shows that each item's cross loadings load more on its related construct than any other. For example, for the item Perceived Ease of Use (PEU) cross loadings of PEU1,PEU2, PEU3, PEU4 are 0.773, 0.767, 0.816, 0.730, 0.841 respectively which are higher than others.

Other methods used to find the discriminant validity is Fornell and Larcker Criterion (see Table 4) and heterotrait – monotrait ratio of correlations (HTMT) method (see Table 5) . The results in Table 4 show that the minimum value of the square root of AVEs (shown on the diagonal) is more than correlation coefficients falling below the diagonal in the corresponding columns. The findings in Table 5 indicate that all the values are below 0.90 [36] Hence, no threat for discriminant validity is found.

**4.2 STRUCTURAL MODEL ASSESSMENT**

The analysis of structural model is done after the validity of measurement model. Consistent PLS Bootstrapping is run using SEMinR package (see for details [29], [28]) to test hypothesis H1 to H8. Table 6 shows the path coefficients and Table 7 summarizes the finding in structural model assessment.

From Table 7 and Figure 3, it can be seen that Trust positively affects perceived usefulness (H1) and attitude (H2). Perceived ease of use positively affects trust (H3) and perceived usefulness (H4). Perceived Usefulness positively affects Attitude (H6) and Attitude positively affects Behavior Intention (H8). Hence, H1,H2, H3,H4, H6 and H8 were supported and H5 and H7 were not supported

**Table 3 : Cross Loadings ( Discriminant Validity)**

	Perceived Ease of Use	Perceived Usefulness	Attitude	Trust	Intention
PU1	0.513	0.822	0.356	0.434	0.349
PU2	0.517	0.853	0.497	0.422	0.439
PU3	0.578	0.804	0.440	0.492	0.335
PU4	0.653	0.840	0.566	0.666	0.411
PEU1	0.773	0.496	0.316	0.472	0.198
PEU2	0.767	0.473	0.363	0.361	0.252
PEU3	0.816	0.650	0.459	0.548	0.450
PEU4	0.730	0.390	0.330	0.269	0.348
PEU5	0.841	0.621	0.517	0.606	0.427
T1	0.564	0.529	0.513	0.736	0.460
T2	0.571	0.609	0.570	0.883	0.426
T3	0.392	0.417	0.363	0.856	0.264
T4	0.406	0.453	0.367	0.857	0.257
ATT1	0.541	0.509	0.852	0.593	0.62
ATT2	0.474	0.519	0.910	0.446	0.724
ATT3	0.418	0.498	0.893	0.515	0.714
ATT4	0.443	0.502	0.886	0.426	0.673
ATT5	0.422	0.492	0.878	0.511	0.715
BI1	0.369	0.387	0.675	0.366	0.822
BI2	0.391	0.431	0.671	0.412	0.839
BI3	0.335	0.363	0.601	0.299	0.825
BI4	0.361	0.372	0.626	0.375	0.819

**Table 4: Fornell-Larcker criterion (Discriminant Validity)**

	Perceived Ease of Use	Perceived Usefulness	Attitude	Trust	Behavior Intention
Perceived Ease of Use	<b>0.786</b>	-	-	-	-
Perceived Usefulness	0.687	<b>0.830</b>	-	-	-
Attitude	0.520	0.570	<b>0.884</b>	-	-
Trust	0.598	0.619	0.564	<b>0.835</b>	-
Behavior Intention	0.441	0.465	0.780	0.441	<b>0.826</b>

**Table 5: Heterotrait-Monotrait Ratio (HTMT)**

	Perceived Ease of Use	Perceived Usefulness	Attitude	Trust	Behavior Intention
Perceived Ease of Use	-	-	-	-	-
Perceived Usefulness	0.779	-	-	-	-
Attitude	0.568	0.629	-	-	-
Trust	0.649	0.690	0.608	-	-
Behavior Intention	0.501	0.543	0.877	0.493	-

**Table 6: Path Coefficients**

	Behavior Intention	Attitude	Perceived Usefulness	Trust
R <sup>2</sup>	0.609	0.406	0.539	0.360
AdjR <sup>2</sup>	0.606	0.399	0.535	0.357
Perceived Ease of Use	NA	0.140	0.495	0.600
Perceived Usefulness	0.030	0.286	NA	NA
Attitude	0.763	NA	NA	NA
Trust	NA	0.302	0.322	NA

**Table 7: Hypothesis testing of the model (significant at p < 0.05)**

		Original Est.	Bootstrap Mean	Bootstrap SD	T Stat.	2.5% CI	97.5% CI	Result
H1	Trust -> Usefulness	0.322	0.320	0.060	5.362	0.205	0.439	Accepted
H2	Trust -> Attitude	0.302	0.301	0.072	4.190	0.160	0.438	Accepted
H3	Ease -> Trust	0.600	0.602	0.043	14.008	0.512	0.681	Accepted
H4	Ease -> Usefulness	0.495	0.498	0.062	8.018	0.375	0.608	Accepted
H5	Ease -> Attitude	0.140	0.137	0.077	1.813	-0.028	0.275	Rejected
H6	Usefulness -> Attitude	0.286	0.288	0.064	4.446	0.162	0.413	Accepted
H7	Usefulness -> Intention	0.030	0.028	0.047	0.647	-0.064	0.119	Rejected
H8	Attitude -> Intention	0.763	0.765	0.037	20.647	0.696	0.838	Accepted



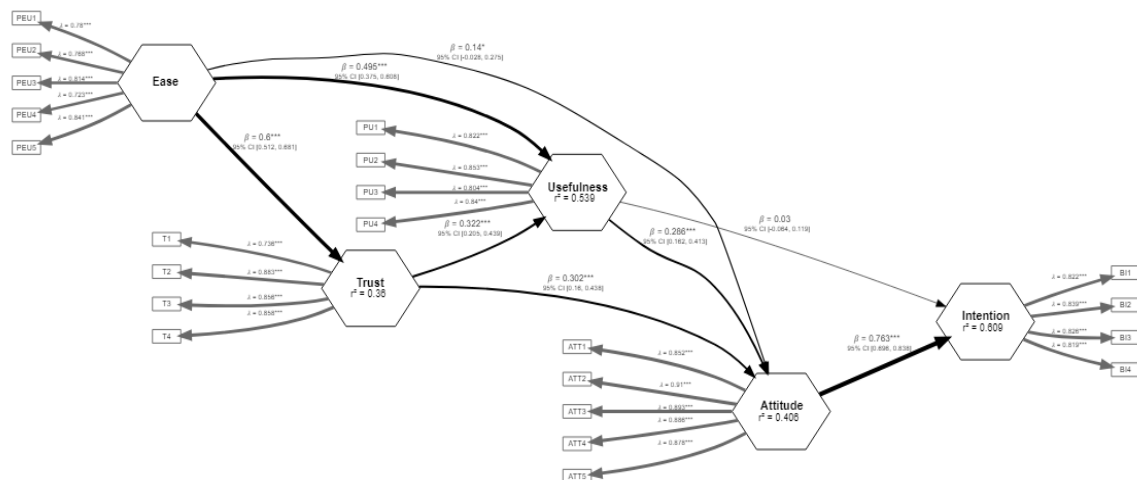


Figure 3: Loading and Coefficients

5. CONCLUSION:

Using SEMinR package of R and applying TAM, the behavior intention of customers, who do online shopping through apps and websites enabled by AI is analysed. This study made it easier to figure out the customer’s behavior while using AI-enabled shops or apps. The use of TAM in the study was found suitable as it was suggested in previous studies ([3], [37], etc). The model confirmed, as anticipated, that attitudes, perceived usefulness, perceived ease of use, and trust are the primary factors which influence consumers' behavioral intention to use AI-powered webshops and apps. But it is also observed that the perceived ease of use doesn't affect attitude contrary to TAM original model [10]. From the study it is found that perceived usefulness impacts the attitude and trust affects the perceived usefulness and attitude. Perceived ease of use affects trust and perceived usefulness positively and attitude affects behavior intention. The results of this study could be helpful to owners of online shops in order to know their customers' acceptance of AI powered apps or webshops for online shopping.

6. LIMITATIONS AND FURTHER RESEARCH

The cross-sectional data in this study is one of its limitations. As the customers are adopting and

accepting the online shopping web sites and app with AI more. So, future research in this area may be taken with the longitudinal research design. Another limitation was the respondents from some part of India. Future study can be conducted in other geographical regions. Third, the demographic characteristics of the respondent was not used in the factors. Future researcher may consider it.

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