

Investigating the Effects of the Big Data Analytics on Customer Response in Online Purchases

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Submitted: February 09, 2022

Revised: May 26, 2022

Accepted: June 11, 2022

Published online: June 30, 2022

ABSTRACT

Purpose: The concept of big data has gained tremendous attention in recent years. Most businesses are now looking for possible ways to understand the effects of big data on business settings and how it can help to achieve a competitive edge for the business. The current study however endeavors to investigate the effects of big data analytics (BDA) in predicting customer response to online purchases.

Design/Methodology/Approach: The survey was conducted and collected data from the students at universities that exist in Peshawar city. A total of 400 students participated in the study for the period of 1st to 30th April 2022. A total of 235 respondents responded accurately and filled out the questionnaire, and the remaining were outliers and excluded from the study.

Results: The results showed that the information search, dynamic prices, recommendation system, and customer services have a significant positive impact on responses of the customers whereas security concerns, shopping addictions, and group influences have a significant negative impact on responses of the customers.

Contribution: The study will be useful for developing influential policies for the companies by finding the factors affecting customer response in a multi-cultural environment through using BDA. It will also allow the customers to understand their practices more clearly in the era of BIG Data.

Keywords: Big Data Analytics; Online Business; Customer Response.

1 | INTRODUCTION

A massive volume of data is streaming that inundates a business on a day-to-day basis ([Naeem et al., 2022](#)). Data is valuable to any organization however data should be integrated, analyzed, and queried. According to [Hariri et al., \(2019\)](#), almost five billion people are connected to the internet generating a huge amount of data using several devices. Majorly data is being generated in large quantities through social media, mobile apps, e-commerce sites, and official websites ([Song, Yoo, Yang, Yun, & Shin, 2022](#); [Zhang, Zang, Zhu, Uddin, & Amin, 2022](#)). Consequently, a huge amount of data is being produced either structured or unstructured through excessive usage of these devices. However, this has become possible because of the advanced network technology known as Big Data (BD) which facilitates businesses to make well-versed decisions.

However, recently big data has attained increased attention from academia ([Naeem et al., 2022](#)). According to [Hariri et al., \(2019\)](#) BDA is defined as databases that have a large size, are detained, exchanged, pile up, and investigated can be named as BD. Similarly, Ghani et al., ([2019](#)), defined BDA as the data generated from multiple sources like the transactions connected with cell phones, multiple clicks from the internet, the contents generated by the users and social media in addition with the transactions linked with different businesses and the information available for and from the customers and their purchase behavior. The unique features of BD named

as five V's which are volume, velocity, variety, value, and veracity bring capable to differentiate it from the conventional sorts of data used as a source for analysis ([Vassakis, Petrakis, & Kopanakis, 2018](#)).

It is not surprising to mention that almost every industry in this technological era has shifted its concentration toward understanding the business implications of solving the problem through BDA ([Mariani & Borghi, 2021](#)). BD facilitates the prediction of the unemployment range, the roadmap for growth in the economy, and the future tendency of those who want to invest their money in different sectors ([Deepa et al., 2022](#)). The economy of a country is depending upon the supply and demand for different products and services by the customers ([Oesterreich, Anton, Teuteberg, & Dwivedi, 2022](#)). To make good decisions the companies' records of databases which are structured, unstructured, or semi-structured can be the best source on which the companies can rely ([Del Vecchio, Mele, Passiante, & Serra, 2022](#); [Ryen, Soylu, & Roman, 2022](#)). 5 to 6% of companies are more productive and add value than their competitors who applied BDA ([Mariani & Borghi, 2021](#); [Sumbal et al., 2019](#)).

Most of the recent studies investigated the positive aspects of using BDA ([Cappa, Oriani, Peruffo, & McCarthy, 2021](#); [Yu, Wong, Chavez, & Jacobs, 2021](#)), however, very little attention has been given to understanding the negative factors of BDA such as the customer's privacy and security concerns ([Anandarajan, Hill, & Nolan, 2019](#)), shopping addiction ([Le & Liaw, 2017](#); [Lo & Harvey, 2012](#)) and group influences ([Mariani & Borghi, 2021](#)). Due to the increased range and varieties of products and services customers have now become more attentive in making their purchase decisions. With this attitude, the customers' behavior has now become a challenging task for businesses to cope with ([Q. Chen, Feng, Liu, & Tian, 2019](#)). Based on the related research and reviews, this study will address the different impacts of big data on the e-commerce experience for customers. The current work will help researchers improve BDA usage in e-commerce based on analyzing customers' experiences.

The BDA is now the emerging source for predicting the actual behavior of customers ([Liao & Yang, 2021](#); [Liu, Shin, & Burns, 2021](#)). But there are very few studies that seek to understand the customers' opinions on big data analytics, especially for online shopping ([Liu et al., 2021](#); [Shamim, Yang, Zia, & Shah, 2021](#)). It is; therefore, the current study focuses to determine the positive and negative factors of Big Data analytics affecting the behavior of customers from multicultural environments, particularly in the Pakistani context. This study investigated the impact of Big Data Analysis on customer online buying behavior.

2 | LITERATURE REVIEW

Big data has been known as sets of data or a combination of them ([Naeem et al., 2022](#)). In academia, big data about science information and digital communication is at the initial stages of computing. However, recently the data has been improving and growing on a regular daily basis due to the use of many devices and platforms i.e. web sites, cell phones, call centers, and other social media sites ([Malhotra & Rishi, 2021](#)).

Due to the advancement in technology, nearly all businesses are now get affected by the changes in the behavior of the individual's choices ([Mariani & Matarazzo, 2021](#)). These changes encouraged the researchers to study more about the consumers' purchasing behavior. The crises regarding economics and finance occurred in 2008, which leads to confusion in purchasing products for consumers and the need was arises for online marketing. Consumers compared the product's prices and shapes by using the internet ([Hoeper et al., 2022](#)). Due to the increased diversity in the products, individuals are confused and facing difficulties in selecting the suitable

and best products for themselves ([Ambilkar, Dohale, Gunasekaran, & Bilollikar, 2022](#); [Chen & Chi, 2021](#)). As resultantly, the behavior of the customers has now become more irregular thereby emerging new sources that nevertheless help to understand their behavior of purchasing accessories. Among them, one biggest sources is that big data ([Trifu & Ivan, 2014](#)).

To understand the behavior of the customer, the BDA is of great help to businesses ([Du & Lin, 2022](#); [Lv, Shi, & Gursay, 2022](#)). However, there are some pros and cons while using big data analytics, particularly in e-commerce. “Information search, dynamic pricing, a recommendation system, and customer service” are considered positive factors in implementing BDA ([Le & Liaw, 2017](#)). The forms of BA like the emotions of the consumers, locations where they are from, and their hobbies, the companies can locate and get information about the preferences in demands, and their relation with the products for the satisfaction of the consumers ([Astudillo, Bardeen, & Cerpa, 2014](#)). To create value for consumers the e-commerce firms apply and analyze BD for generation of the customized offers, multiple prices, and channels selection ([Aker & Wamba, 2016](#)). Online shopping can provide a more direct experience and leads to an increase in the desire for buying the products the customers ([Guangting & Junxuan, 2014](#)). The mentioned factors can create positive intentions towards buying the products online and stimulate the demands for it of the customers.

Although, by the implication of big data companies can get a lot of advantages on the other side there are some negative factors also involved ([An, 2022](#)). Customers are concerned about their privacy of information. Due to more attraction and huge volume, big data catch attraction of hackers, due to its large volume, the probability is increased sensitivity of information ([Kshetri, 2014](#)). Research stated that security concerns are increased by customers and affect their behavior toward buying online products ([Le & Liaw, 2017](#)).

Customers who are addicted to shopping are failed to control their desires and they purchased products that they are not even needed or they like ([Müller et al., 2019](#)). This habit shows two basic dimensions; spending tendency and feelings before purchasing the products ([Müller et al., 2019](#)).

Group influences are applied to buying online products by consumers ([Dalziel & De Klerk, 2021](#)). Groups they belong to change their behavior for buying or not buying the products online ([Fernandes, Venkatesh, Panda, & Shi, 2021](#)). Sometimes they purchased products when they think this is connected to the same mind people while sometimes, they rejected the products due to their connection with them ([Hung, Cheng, & Lee, 2021](#)). Customers changed their behavior because of their connection with certain groups ([Ahmad, Vveinhardt, & Ahmed, 2014](#)). According to the above discussion, negative factors are security concerns, shopping addictions, and group influences. Customers are feelings not good when they know that the e-companies know more about them ([Kshetri, 2014](#); [Trom & Cronje, 2019](#)). The said factor affects negatively and decreases the intention towards buying online products ([Guangting & Junxuan, 2014](#)).

2.1 | Hypothesis for the Study

H₁: *Positive factors of applying big data analytics has a positive relationship with consumer response.*

H₂: *Negative factors of applying big data analytics has a negative relationship with consumer response*

2.2 | Model for the Study

The model “AIDA” is an abbreviation of the Attraction, Interest, Desire, and Action used in the study. The detailed steps included in the model are first it must attract the customers to the website by promoting attractive messages and recommendations, then it must create the interest of customers by showing them the benefits of the

products, third, the e-vendors are busy generating desires towards the products and last, they will purchase the actual product from the e-vendors. In this study, the researcher is intended to measure the customer intention and behavior stages separately. Through mentioned factors, the researcher used the AIDA model for measurement of the intention which leads to the combination of the first two stages i.e., attraction and interest, and behavior which leads to the combination of desire and action. The model consists of the factors positively and negatively affecting the intention towards the behavior of using big data analytics of the customers.

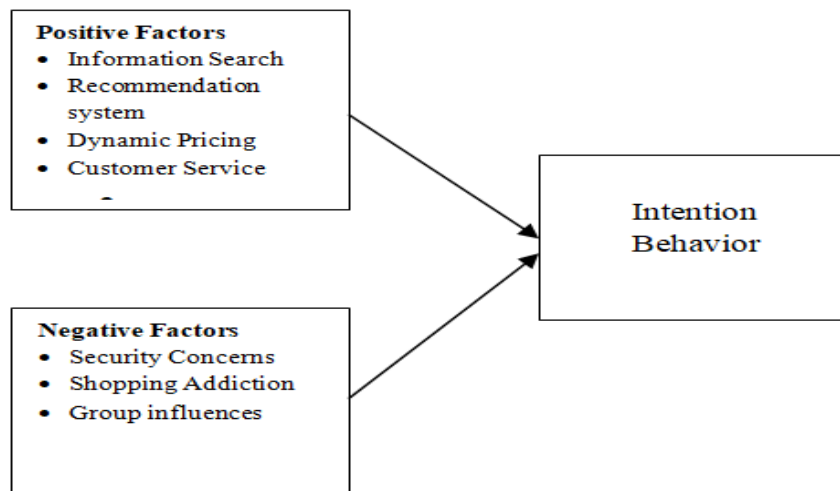


Figure 1: Model for the study

3 | RESEARCH METHODOLOGY

Livingston & Haardörfer (2019) argued that there are no actual parameters available in studies for the selection of sample size in relation to the path model. They mentioned that the studies have a ratio of 20:1 or 10:1 which would be the ideal one for many cases to the number of parameters. Based on this information the studies should have a minimum number of samples from the population of 220 cases. In this study, we have taken more than 220 sample sizes for better results.

The use of the internet in today's world is growing rapidly and especially Asia now becoming the growing e-commerce market. Pakistan is one of them where according to Hootsuite more than 44.61 million internet users in 2019. Pakistan is now a growing market for online shopping. People now converting to online shopping rapidly and it has been selected for the current study to investigate the effects of Big Data analytics in predicting customer response.

The survey was conducted and collected data from the students at universities that exist in Peshawar city. The reason for selecting the students only from one city was that they are more constant users of the internet than any other part of the population and further there are limited financial resources. A total of 400 students participated in the study for the period of 1st to 30th April 2022. A total of 235 respondents responded accurately and filled out the questionnaire, and the remaining were outliers and excluded from the study. Their demographic characteristics were not significantly related and were excluded from further investigation.

Table 1. Demographic Characteristics			
Variable	Valid	Frequency	%Age
Gender	Male	172	73%
	Female	63	27%
How many times do you access the e-commerce web in a month?	1-2 times	77	33%
	3-5 times	65	28%
	More than 5	93	40%
Which kind of product you most selected for your survey?	Electronic Items	91	39%
	Fashion Items	144	61%

The questionnaire was distributed through personal contact and email among those students who have experience with the internet and visiting websites for online shopping. Two items were selected for the survey which is considered the most searched items by the participants on online websites fashionable items and electronics items. The questionnaire was selected from the study conducted in Vietnam for a similar kind of study and the pilot study was performed for reliability and validity in the context of Pakistan experts. The questionnaire was designed to take the perception of customers about the constructs and at the end, they were assessed through their demographic as well. The researcher has followed the 05-point Likert scale ranging from strongly agree 01 to strongly disagree 05.

4 | RESULTS AND ANALYSIS

“SmatPLS3.0” has been used for data analysis and two steps process was followed ([Hair, Risher, Sarstedt, & Ringle, 2019](#)). First, the data has been checked for its reliability and model fitness by using confirmatory factor analysis (CFA), and second, the relationship in constructs has been checked through a structural equation model (SEM). The internal consistency of the variables was checked through Cronbach’s Alpha test ([Maichum, Parichatnon, & Peng, 2016](#)). The recommended value for the variables was 0.70 ([Hair et al., 2021](#); [Hair et al., 2019](#)), and the results fulfilled the recommended criterion where the values for variables are ranging from 0.753 to 0.825.

Two-stage analytical procedures were used to present the results. In the first stage, the confirmatory factor analysis was adopted to measure the model fitness and data reliability and validity. In the second stage, the structural equation model was used to show the hypothetical relationship among the constructs.

4.1 | Measurement Model

According to the study of ([Hair et al., 2021](#); [Hair et al., 2019](#); [Maichum et al., 2016](#)), the recommended criterion for factor loading is it should be greater than 0.70. for the current study, the values of factor loading are significant and greater than the recommended criterion as its value is in the range of 0.735 to 0.792. According to them, to test the construct reliability the values of composite reliability (CR) and average variance extracted (AVE) should be greater than 0.700 and 0.500 respectively. Table 2 shows the values for these tests where the results are in the range of 0.814 to 0.856 and 0.612 to 0.785 for CR and AVE respectively.

Table 2. Factor Loading, composite reliability (CR), and average variance extracted (AVE)				
Constructs	Items	Standardized Factor Loading	Composite Reliability (CR)	Average Variance Extracted (AVE)
Positive Factors	IS	0.762	0.856	0.612
	RS	0.745		
	PD	0.746		
	CS	0.739		
Negative Factors	PS	0.772	0.835	0.785
	SC	0.755		
	GI	0.735		
Customer Responses	CATI	0.792	0.814	0.756
	CDAC	0.785		

As results from the study are showing that the values for the tests named “NFI, SRMR, and the ratio of Chi-Square and degree of freedom fulfill the criterion where the NFI is 0.992 greater than 0.9 and the value of SRMR 0.079 which is less than 0.08 and the value of Chi-Square/df is 2.795 which is less than 3.00 is indicated that they are fulfilling the criterion recommended in previous studies and leads to the sign that the model is a good fit for the study. Table 3 shows the results.

Table 3. Model Fitness			
Measures	Criterion	Results	Sources
Normal fit index (NFI)	>0.9	0.992	(Hair et al., 2010)
SRMR	<0.08	0.079	(Sarstedt et al., 2014)
Chi- Square/df	<3.0	2.795	(Hair et al., 2010)

The second stage of the process for results testing is to check the hypostatic relationship of the constructs. The structural equation model has been used and the results for the path coefficient are shown in figure 2. The results for the positive factors in relation to customer response are $\beta_1 = 0.853$, $t=9.35$, and $p<0.000$ indicating that hypothesis 1 is accepted. The results for testing hypothesis 2 are $\beta_1 = -0.235$, $t=2.56$, and $p<0.05$ showing the acceptance of H2 as well. But the role of positive factors in applying Big Data Analytics in customer behavior is more important than negative factors as shown in the results by the comparison of i.e. $\beta_1 = -0.235$ and $\beta_1 = 0.853$.

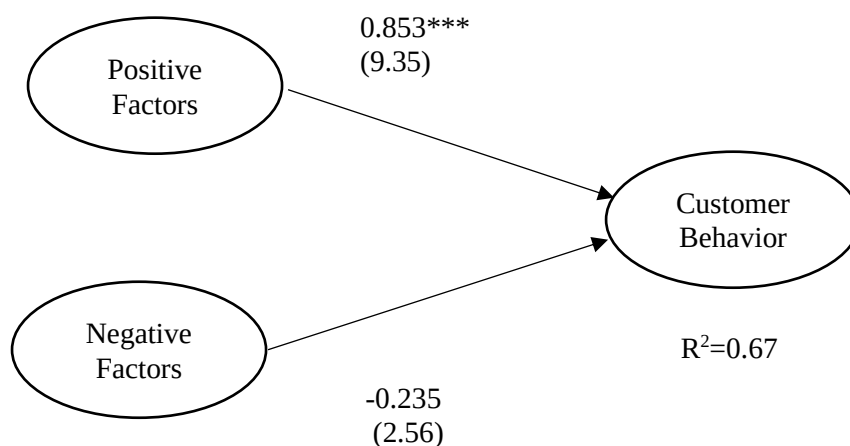


Figure 2: Structural Equation Model (SEM) Results

The regression analysis of individual variables has been presented in table 4. The overall factors including positive and negative explain 51.2% of changes in the intention of the individuals. The results indicated that information search, dynamic prices, a recommendation system, and customer services have a significant positive impact on intention whereas other factors like security concerns, shopping addictions, and group influences are a significant negative impact on the intentions of the individuals. Similarly, the same impact of these variables exists on the behavior of the individuals as well and the results show that 48.7% variation exists in the behavior of the individuals due to these variables.

Table 4. Regression Analysis			
	Items	Intention	Behavior
Positive Factors	IS	0.311***	0.348***
	RS	0.345**	0.245**
	PD	0.235**	0.154***
	CS	0.195**	0.123**
Negative Factors	SC	-0.026**	-0.175**
	SA	-0.018*	-0.131**
	GI	-0.031**	-0.126**
	R2	51.20%	48.70%

Big data analytics affects the response of the consumer differently at multiple stages. When a customer is going to search and has an intention towards the purchase then he or she has more affected by positive factors than negative ones. But at the stage of behavior and actual purchase, the customers are affected mostly both by positive and negative factors.

5 | DISCUSSION

The results of our study indicated that both the positive and negative factors affected the customer's responsibility. Furthermore, results showed that information search, dynamic prices, a recommendation system, and customer services have been considered significant positive factors in customers' intentions and behavior ([Del Vecchio et al., 2022](#); [Liao & Yang, 2021](#)). The results also revealed that the recommendation system has more highly significant to the intentions of the individuals than their behavior ([Naeem et al., 2022](#)); it means that the recommendation system by companies can boost the intentions of the customers more than their behavior ([Le & Liaw, 2017](#); [Müller et al., 2019](#); [Zhang et al., 2022](#)). Information search has also affected customer intention and then after this, it increases the behavior for purchases ([Oesterreich et al., 2022](#); [Song et al., 2022](#)). This satisfaction comes because of information provided by the companies through BDA ([Akter & Wamba, 2016](#); [Liao & Yang, 2021](#); [Lo & Harvey, 2012](#)). Security concerns, shopping addictions, and group influences are considered significant negative factors on customers' intentions and behavior ([Liao & Yang, 2021](#); [Yu et al., 2021](#)). Security concern is considered to be the most highly influential variable on intention than behavior, this is because of the companies' capability to detect fraud through BDA ([Akter & Wamba, 2016](#)). The results show positive factors are more influential than negative factors on customer response ([Oesterreich et al., 2022](#); [Zhang et al., 2022](#)).

6 | CONCLUSION

The current study concluded that to customize customers' preferences and increase the level of satisfaction companies are now applying BDA as a new method for providing information and a more dynamic environment.

Leading franchises are using BDA as a tool and are now successfully achieving and adding value to their business. Though, it has been also bringing some issues to the customers' side, which are presented in this study as positive and negative factors. Companies need to start using the BDA to survive in the market by following the process in respect of sources of data, skills, and the creation of competitive advantage. This trend is now developed, and companies should be followed to apply it in their operation for better decisions and strategies. The process of implementation of BDA has some pros and cons for which the companies should create an environment to minimize the cons and goes for the maximum benefit.

In future studies, the researcher can take a sample of other professionals that know using the internet. This study is conducted in the context of Pakistan however the future researcher may take the sample from other countries since every country has different culture and education level. The researcher may also include more variables in the study which are not being considered in the current study. It is also suggested to the future researcher that they may conduct a study on the cross-culture comparison of two developing countries.

I certify that the intellectual content of this thesis is the product of my work and that all the assistance received in preparing this research and sources have been acknowledged. Further, there are some limitations to conducting this study like limited financial resources and time constraints. Moreover, the data has been only collected in the research was only limited to one city.

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