

# Impact and development of e-commerce on consumer retention due to the coronavirus disease (COVID-19) in context to developed countries

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DOI: 10.29322/IJSRP.12.11.2022.p13102

<http://dx.doi.org/10.29322/IJSRP.12.11.2022.p13102>

Paper Received Date: 16th September 2022

Paper Acceptance Date: 21st October 2022

Paper Publication Date: 6th November 2022

**Abstract-** The increase in COVID – 19 pandemic altered the retail industries towards electronic commerce (e-commerce). In e-commerce consumer retention is effective factor for decision making of business. The e-commerce industry is involved in collect, store and analyze of the vast range of data stated as e-commerce analytics. With the drastic advancement in customer transaction data, retail stores leverage data analytics for customer superior for offering mutual and unattainable benefits. Nonetheless, fulfillment of such a strategic aim requires retailers to adopt and embrace emerging e-commerce retail consumer purchase. Analytics is technological-oriented with between strategic implications one-commerce analytics of research. Previous research also underlined the significant impact of e-commerce analytics on customer process, relationship management, customer acquisition, and retention, etc. This article concentrated on the evaluation of customer analytics and retention for consumers of e-commerce industries. The examination is based on e-commerce analytics for the evaluation of customer perspectives. Through analysis of customer perspectives with e-commerce analytics consumer retention strategies are examined. The analysis based on six goals such as increasing insight of customer, operational efficiency, business agility, transparency of operation, business performance and business trends. The data analysis is based on quantitative based primary data collection from 5 different sectors. The statistical analysis of results expressed that web or social media is key factor in highest priority area in retail organizations. The statistical analysis also expressed that the customer acquisition and retention strategies are highly influenced by thee-commerce retail consumer purchase. The findings also stated that e-commerce retail analytics provides relationship with business process and acquisition.

**Index Terms-** Data Analytics, Retailer, Customer, Personalized products, Digitization

## I. INTRODUCTION

In recent years, COVID – 19 pandemics strongly affects the operation of business and consumer activity [1]. The spread of COVID – 19 impacts on digital transformation and organizations are examined. The impact of COVID – 19 influences on the consumer behaviour impacts on the attention of the researchers. Also, industry and survey stated that the pandemic accelerated the e-commerce trend prior to the crisis. The increase in pandemic notably influences on the perception of consumer that impacts e-commerce platform both economic and environmental terms [2]. Some researchers observed that the change in habits of consumer during pandemic exhibits variation in structural changes in the e-commerce business for both developing and developed countries. During SARS pandemic in China between 2002 – 2003 leads to global increase in online business with estimation of uncertainty for remained behavior in online

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<http://dx.doi.org/10.29322/IJSRP.12.11.2022.p13102>

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purchase. Further, in case of e-commerce business it is necessary to understand the potential role and pandemic on e-commerce post COVID – 19 [3]. Hence, it is necessary to evaluate the consumer purchasing behaviour on the e-commerce with respect to developing and developed countries.

At present, retail incorporates changes in quantitative and qualitative multitude with consideration of consumer purchasing buying behavior [1]. The consumer buying intention is based on the combination of demographics, disposable incomes, the aspiration of customers, and urbanization. With remarkable modification in the lifestyle of consumers and resultant shifts are based on habits and patterns in buying options [2]. Those changes in consumer lifestyle dramatically alter the e-commerce as per the expectations of consumers' demand to achieve a unique experience especially in pandemic COVID -19. To withstand shift in customer demand and expectation retailers need to grips shopping behavior in multi-channel shopping [3]. So, the form must formulate, extend, and serve with different offerings. In the globalization of the economic era, customer retention needs to understand the customer expectations is considered by retail managers [4].

Additionally, the e-commerce industry is driven by innovative, dynamic, and global transformation [5]. Also, the increase in inter-format and Intra-format retail industry express pressure over customer-centric approach for the differentiated and excellent shopping experience [6]. In this, the retailer needs to gain significant knowledge about customer preferences and expectations. Through understanding, the retailer can able to provide adequate services, promotions, and merchandise to withstand customer demands [7]. However, retailers need to grapple with the changes in the behavior of customers to withstand competitive market technology with the evolution of digital technology with innovation in mobile and proliferation of social media [8].

In the revenue stream of customers need to acquire information over a certain time. E-commerce industry needs to alter the way to cope with customers changes using formulated strategies to purchasing intention of consumers [9]. The customer was able to comparatively examine the e-commerce industries. The examination can be of store quality, prices, sales, and loyalty [10]. In this context, the estimation of buying trends is a prominent factor in e-commerce customers' purchasing behavior analytics exhibits the impact of retail customer trends of purchase, where and how to purchase can be done based on personal preference [11]. Retailers with e-commerce analytics comprise of terabyte processing of multiple data and historical data to improve the overall revenue.

This research intended to evaluate the relationship of consumer purchasing intention on e-commerce business. The analysis is based on examination of effort of pandemic COVID -19 during and after pandemic lockdown. Specifically, this research aimed to identify answer How did consumer purchasing behaviour during and post COVID -19 pandemic. The data for analysis is based on consideration of e-commerce consumers for purchase intention. The analysis is based on primary data collection from e-commerce consumers by using google forms. The statistical analysis is performed to evaluate the purchasing behaviour of the e-commerce consumers. This paper is organized as follows: In section I presented about overview of e-commerce followed by evaluation of related works on based on e-commerce on consumer retention in section II. In section III overall research methodology adopted in this analysis is presented. In section IV and V presented about overall illustration of results and discussion is presented. Finally, in section VI presented overall conclusion of results obtained.

## II. RELATED WORKS

In recent years, retail industry has been adopted in wide range of perspectives to gain customer perception. This section provides review of literature related to customer acquisition and retention strategies for interspersede-commerce analytics, conceptual framework and constructs. Finally, overall review about identified research gap and justification for research are presented.

### 2.1 Customer Acquisition and Retention in e-commerce

Several researchers expressed that customer process is based on processes, customer acquisition and retention [19]. In marketing and operations issues related to alignment is based on acquisition and retention management. This involved in consideration of management operations and services [20]. To increases the customer profitability maintenance and growing companies success with respect to various industries. In industries, customer acquisition and retention process are significantly correlated. Researchers evaluated the modeled issues together and separately. A customer acquisition of firm concentrated on information acquired from potential customer, potential value and resource availability for long term [21]. Customer acquisition and retention are exclusive in business with consideration of different degrees [22]. In [23] stated that steady customers put pressure over firm to acquire new customers subjected to increase in cost and risk. With prospects lack of firm knowledge is considered as significant

predictor of vendors, which causes massive high-dimensional data. The selection of appropriate variable and functional relationship is based on acquisition probabilities for sustainable issues.

Another research conducted in [24] expressed that the 59% comprises of brick and mortar for acquisition as primary objective. The main objective is obtained with 19% for retention of customer. Also, analysis expressed that the 55% of retailers are single brand and 59% of population were multi-brand customers for acquisition. Further, it is observed that a 75% of marketing is based on retention of customer acquisition. It is expected that for next 3 years customer acquisition will be moving towards retention. Consequently, retailers concentrated on how to retain new customers and they are unsure about the target.

## 2.2 Customer Retention in e-commerce

In several industries, customer retention is growing concern to increase the profits and sales at considerable time and resource evaluation to increase the profits and sales. The searching for resources are based on examination of new customer and retain the customer profitability. Researchers, substantially involved in customer retention and costs for acquisition of customer [25]. Retention involved in efficient relative factor for special and important about customer retention. Several companies consulting, cable service, finance and retention for long term. The orientation of customer retention concentrated on information, differentiation and resource allocation for relationship management with customers those are existing based on consideration of long-term. In retention of customer and growth marketing actions are contacts, programs of loyalty and cross-selling factors [26]. Empirical analysis expressed that marketing strategy can be through direct mail, sales and telesales those influence on retention of customer [27].

Customer perception is based on amount they buy, stay and referrals [28]. Based on this in to consideration [28] presented an impact of customers as long-tenure and referrals those comprises of customer retention strategy. However, few research expressed that customer retention are standing at higher volume with minimal customer tenure. The results expressed that weak relationship exists between customers tenure and profitability of firm. Also, it stated that retention of customer is based on customer relationship and service quality. The minimal trust plays involved in customer defection and general product features [29]. In [30] identified that customer profitability is increased with effective marketing strategies for accurate information gathering. Marketers, continually focused on effective understanding of customers.

This research concentrated on evaluation of e-commerce analytics in the retail stores. The data were collected from 5 retail stores such as apparel, food & Grocery, entertainment and consumer durable sector. The research design and data collection described are presented as follows:

### III. RESEARCH METHOD

**Research Design** - To collect data for analysis this research adopts *a descriptive research design*. Through descriptive research factors contribution of e-commerce on retail store is evaluated based on consideration of customer analytics and customer retention. The descriptive research design analysis is based on the consideration of the following hypothesis into consideration.

**Data collection type** - The secondary data collection is based on *quantitative data* analysis. The dataset is associated with a numerical value, number, or counts for the examination of numerical values. Based on the collected data analysis is performed and the conclusion is derived.

**Sampling:** This research includes primary data collection method to examine impact of e-commerce analytics on consumer retention and analytics. The sampling considered for analysis are presented as follows:

**Primary Data:** The contribution of e-commerce analytics on retail store for customer retention and analytics is performed based on primary data collection.

**Data Collection method:** To collect data form employees google form is created for collection of data. The data collection consists of questionnaire for data collection for analysis.

**Population:** Data related toe-commerce analytics on retail store are collected from employees those are in retail manager, business analysts and IT professionals.

### IV. DATA ANALYSIS

This research intended to evaluate the contribution of e-commerce analytics on retail of customers. The data for analysis is collected by means of primary data collection from Retail managers and/or retail IT professionals familiarised and/or working withe-commerce retail consumer purchase in food and grocery, apparel, consumer

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<http://dx.doi.org/10.29322/IJSRP.12.11.2022.p13102>

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durables and entertainment retailing in the China and Bangladesh were invited to participate in the survey through self-administered structured questionnaire as well as online (survey monkey) survey method. A total of 630 e-commerce consumers are considered. Out of which, 580 questionnaires were rendered usable and rest were found unusable due to incomplete data. This is an approximately 92 percent response rate.

#### 4.1 Descriptive Statistics

The data collected from sample population and respondents are described in this section as follows. The demographic data collected from sample population are illustrated in table 1 with relative consistent and representative of target in e-commerce sector. The demographic analysis is based on consideration of respondent demographic profile in terms of designation, expertise, experience, age and gender.

**Table 1: Descriptive Statistics of Variables**

Description		Total sample n=580	Apparel sector (n=180)	Food & Grocery sector (n=155)	Consumer durable sector (n=140)	Entertainment sector (n=105)	For $\chi^2$ Value at 5% level of significance
Gender	Male	445 (76.7)	130 (72.2)	120 (77.42)	110 (78.57)	85 (80.95)	$\chi^2$ 22.217 df3, $p > 0.05$
	Female	135 (23.3)	50 (27.78)	35 (22.58)	30 (21.43)	20 (19.05)	
Age in Years	25-35	120 (20.69)	43 (23.89)	35 (22.58)	25 (17.86)	20 (19.05)	$\chi^2$ 20.05 df9, $p < 0.025$
	35-45	250 (43.10)	66 (36.67)	57 (36.77)	55 (39.29)	39 (36.14)	
	45-55	144 (24.83)	45 (25.00)	34 (21.94)	40 (28.57)	28 (26.67)	
	55 – 65	66 (11.38)	26 (14.44)	29 (18.71)	20 (14.29)	18 (17.14)	
Marital Status	Married	493 (85.00)	153 (85.00)	131 (84.52)	119 (85.00)	90 (85.71)	$\chi^2$ 5.096 df3, $p > 0.05$
	Unmarried	87 (15.00)	27 (15.00)	76 (49.03)	21 (15.00)	25 (23.81)	
Education	Degree	377 (65.00)	177(66.11)	101 (65.16)	91 (66.43)	68 (64.76)	$\chi^2$ 30.26 df3, $p < 0.001$
	PG & above	203(35.00)	63(16.1)	54 (34.84)	49 (33.57)	37 (35.24)	
Designation	Top/Adman.	290(50.00)	91 (50.56)	78 (50.32)	72(51.43)	53 (50.48)	$\chi^2$ 1.70 df 9, $p > 0.05$
	Middle/Exec	232 (40.00)	73 (40.56)	62 (40.00)	53(37.86)	42 (40.00)	
	Lower level	29(5.00)	9(5.00)	7(4.52)	8(5.71)	5(4.76)	
	Operative	29(5.00)	7 (3.89)	8(5.16)	7(5.00)	5(4.76)	
Expertise	CRM	203(35.00)	63(35.46)	54 (34.84)	51(36.43)	37(35.24)	$\chi^2$ 0.60 df 9, $p > 0.05$
	LSCM	116(20.00)	36 (20.00)	31(20.00)	28(20.00)	21(20.00)	
	ICT	116(20.00)	36 (19.44)	31 (20.00)	29(20.71)	21(20.00)	
	Merchandising	87 (15.00)	28(15.56)	23 (14.84)	20(14.29)	16 (15.24)	
	RCOM	58(10.00)	18(9.44)	16(10.32)	12(8.57)	10(9.52)	
Experience	< 5 years	59 (10.17)	19 (10.56)	15 (9.68)	15(10.71)	10 (9.52)	$\chi^2$ 20.59 df9, $p < 0.025$
	5-10	116(20.00)	35(19.44)	31(20.00)	29(20.71)	32(30.48)	
	10 -15	174(30.00)	53(29.44)	47(30.32)	42 (30.00)	42(40.00)	
	>15 years	231(39.83)	73(40.56)	62(40.00)	54(38.57)	21(20.00)	

Source: Primary data

Note: Values given in parenthesis are calculated in percentage of their column totals.

All the respondents were retail managers, IT professionals and business analysts consisted of 445 male (56.7%) and 135 female (23.3%) with an average age of 37 years (range 25-65). Majority of the respondents (85%) were married. Majority (65%) of the respondents are graduates with technical and IT background. Majority of the respondents (50%) are from top /Administrative level, followed by middle/executive level (40 %). Majority of the

respondents (35 %) have expertise in customer service and customer relationship management, followed by information and communication technology and logistics and supply chain management with 20 percent each. About 40 percent of the respondents have more than 15 years of experience in use of e-commerce retail consumer purchase in their respective domain areas, specifically customer relationship management followed by respondents with 10-15 years of experience, specifically in L&SCM and ICT. The Chi-square test statistic results at 5% level of significance shown in Table 4.1 revealed that respondents' age ( $\chi^2 = 20.05$ , df 9,  $p < 0.025$ ), education ( $\chi^2 = 30.76$ , df 6,  $p < 0.001$ ), and their experience ( $\chi^2 = 20.59$ , df 9,  $p < 0.025$ ), are significantly diverse with type of retail organisation in contrast to the respondents' gender, marital status, designation and expertise which are not significant with the type of retail sector considered in the research. The Chi-square results implied that retail managers in the age group of 35-45 with PG qualification and more than fifteen years of experience have significant association with type of retail sector. Retail managers' choice of retail sector using e-commerce retail consumer purchase are significantly differed with their age, educational qualification and years of experience. Retail managers' age, education and experience are not independent of type of retail sector.

#### 4.1 Trust of Population on e-commerce

Results shown in Table 2 reveal that, overall, 90.5 percent of respondents have trust in retail organisation's working on e-commerce analytics in various business functions. 92 percent of respondents from apparel retailing have trust in organisation's working one-commerce analytics, followed by consumer durable retailing (91%), food and grocery (90%) and entertainment retailing (89.5%). The Chi-square statistic results ( $\chi^2 = 0.90$ , df 3,  $p > 0.05$ ) indicate that there is no difference in the distribution of responses to the outcome variable among the comparison groups. There is no difference among retail managers' trust in four types of retail organisations' working one-commerce. The results shown in Figure 2, by and large, are explicitly implied that respondents have high levels of trust in their retail organisations' working one-commerce analytics.

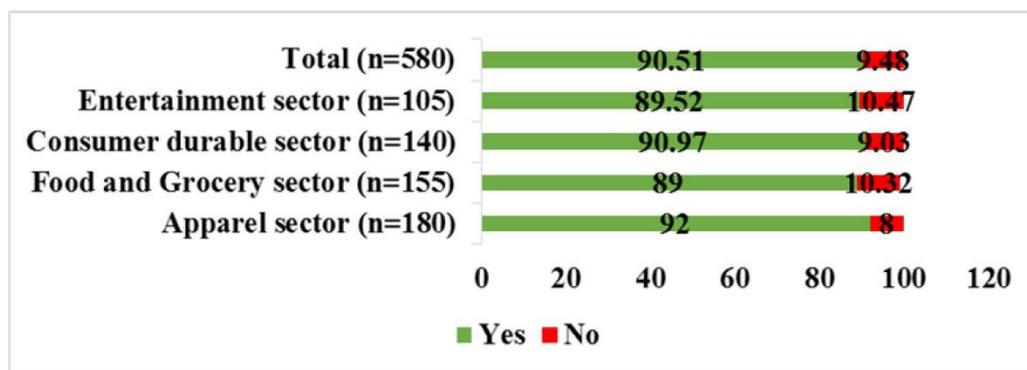
**Table 2: Trust in Organisation's working one-commerce**

Respondent Trust	Apparel sector (n=180)	Food & Grocery sector (n=155)	Consumer durable sector (n=140)	Entertainment sector (n=105)	Total (n=580)
Yes	166 (92.00)	139 (89.67)	126 (90.97)	94 (89.52)	525 (90.51)
No	14 (8.00)	16 (10.32)	14 (9.03)	11 (10.47)	55 (9.48)
Total	180 (100)	155 (100)	140 (100)	105 (100)	580 (100)

Source: primary data

Note: Values given in parenthesis are calculated in percentage of their column totals.

**Figure 2: Trust in e-commerce during pandemic**



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Results shown in Table 3 reveal that, overall, 18.44 percent of respondents' indicated that CRM systems is the most preferred tool for retaining customers followed by loyalty programs (17.06%), regular reviews (11.20%), social media (8.44%), blogs (7.75%), premiums & gifts (7.58), questionnaires and surveys (7.06%), personal touches (6.20%), and magic moments (6.03%). The Chi-square statistic results ( $\chi^2 = 7.81$ , df 27,  $p > 0.05$ ) reveal that there is no difference in the distribution of responses to different strategies for customer retention among the comparison groups.

**Table 3: Adoption of customer retention strategies in e-commerce**

Retention strategies	Apparel sector (n=180)	Food & Grocery sector (n=155)	Consumer durable sector (n=140)	Entertainment sector (n=105)	Total (n=580)
CRM systems	34 (18.88)	32 (20.63)	23 (16.42)	18 (17.14)	107 (18.44)
Loyalty programs	26 (14.45)	27 (17.41)	30 (21.42)	16 (15.23)	99 (17.06)
Regular reviews	20 (11.12)	18 (11.60)	15 (10.71)	12 (11.42)	65 (11.20)
Social media	19 (10.55)	16 (10.32)	12 (8.57)	12 (11.42)	59 (10.17)
Blogs	15 (8.34)	10 (6.46)	12 (8.57)	12 (11.42)	49 (8.44)
Premiums & Gifts	16 (8.88)	10 (6.46)	11 (7.86)	8 (7.61)	45 (7.75)
Questionnaires and surveys	15 (8.33)	12 (7.74)	11 (7.86)	6 (5.71)	44 (7.58)
Personal touches	13 (7.23)	10 (6.46)	10 (7.14)	8 (7.62)	41 (7.06)
Magic moments	10 (5.56)	10 (6.46)	9 (6.43)	7 (6.66)	36 (6.20)
Welcome book	12 (6.66)	10 (6.46)	7 (5.0)	6 (5.71)	35 (6.10)

Source: Primary data

Note: Values given in parenthesis are calculated in percentage of their column totals

#### 4.2 Inferential statistics

The previously described descriptive statistics and factor analysis results were used to test the formulated hypotheses and further analyse the role of e-commerce retail consumer purchase in customer acquisition and retention strategies. The results were described in the following paragraphs and tables.

**H1<sub>0</sub>: There is no mean difference among retail organisations in defining e-commerce retail consumer purchase**

**H1<sub>a</sub>: There is significant mean difference among retail organization in defining e-commerce retail consumer purchase**

To test the above hypothesis, On-way MANOVA is used. The overall test of the One-way multivariate analysis of variance relationship shown in Table 4.39 was rejected at the 0.05 significance level (Pillai's Trace= 0.500,

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F [39, 1698] = 4352.218, p= 0.001; [Wilk’s Lambda = 0.573, F [39, 1670.872] =8.868, p=0.001; Hotelling’s Trace= 0.625, F [39, 1688] =9.012, p=0.001). The results indicated that all three tests were significant. The decision was made that there are mean differences in defining-commerce retail consumer purchase among retail organisations, and further testing was needed. In table 4 multivariate analysis of retail organizations and perception towardse-commerce on retail is presented.

**Table 4: One-way Multivariate analysis of variance**

Effect		Value	F	Hypothesis df	Error df	Sig. (p-Value)
Intercept	Pillai's Trace	0.990	4352.218	13.000	564.000	0.000
	Wilks' Lambda	0.010	4352.218	13.000	564.000	0.000
	Hotelling's Trace	100.317	4352.218	13.000	564.000	0.000
Type of retail Organization	Pillai's Trace	0.500	8.703	39.000	1698.000	0.000
	Wilks' Lambda	0.573	8.868	39.000	1670.872	0.000
	Hotelling's Trace	0.625	9.012	39.000	1688.000	0.000
a. Design: Intercept + Type of Retail Organization						
b. Exact statistic						
c. The statistic is an upper bound on F that yields a lower bound on the significance level.						

Source; Primary data

To determine how the dependent variables, differ for the independent variable, the Univariate ANOVA tests were conducted for each dependent variable. The results (tests of between-subjects effects) revealed that there was significant effect (P<0.005) of retail organisation groups on perceptions of-commerce retail consumer purchase except one perception such as segmenting and targeting customers precisely and optimising customer experiences (p > 0.053).

Further Tukey's HSD post-hoc tests were conducted to follow up the significant ANOVAs identified in tests of between-subjects effects. By and large, the multiple comparisons table reveals that mean difference among retail groups for each perception of-commerce retail consumer purchase was statistically significant (p<0.05) except in some cases where p-value is greater than 0.05. The mixed results implied that there are some similarities and differences among retail groups with respect to perceptions of-commerce retail consumer purchase.

It was proved that there were significant mean differences in defining-commerce retail consumer purchase among four retail organisations. Further, the error variance of the dependent variables was also proved equal across groups among all perceptions of-commerce retail consumer purchase. Hence, null hypothesis was failed to be accepted and alternative hypothesis (H1<sub>a</sub>) was proved to be accepted for all perceptions of-commerce retail consumer purchase.

**H2<sub>0</sub>: Retail organizations and important parameterse-commerce analytics are statistically independent.**

**H2<sub>a</sub>: Retail organizations and important parameterse-commerce analytics are statistically dependent**

To test the above hypothesis, Chi-square statistic is used for testing difference /independence /association of two variables. The Chi-square statistic results ( $\chi^2=0.14$ , df9, p>0.05) shown in Table 4.10 reveals that there is no difference in the distribution of responses to the outcome variable (i.e., important parameter of-commerce analytics) among the comparison groups (i.e., type of retail organisation). Thus, null hypothesis (H2<sub>0</sub>) is proved to be accepted.

The results implied that given the parameters of e-commerce retail consumer purchase were independent on type of retail organisation. Importance of parameters of e-commerce retail consumer purchase were differentiated by comparison groups in retailing. The distribution of the observed number of important parameter of e-commerce retail consumer purchase does not differ significantly among retail organisations.

**H3<sub>0</sub>: There is no difference in objectives of e-commerce analytics among retail organisations.**

**H3<sub>a</sub>: There is significant difference in objectives of e-commerce analytics among retail organisations.**

To test the above hypothesis, Chi-square statistic is used. The Chi-square statistic results ( $\chi^2=61.38$ , df12,  $p<0.001$ ) shown in Table 5 reveals that there is significant difference in the distribution of responses to the objectives of e-commerce analytics among the comparison groups (i.e., type of retail organisation). Thus, null hypothesis (H3<sub>0</sub>) is failed to be accepted. Hence alternative hypothesis (H3<sub>a</sub>) is proved to be accepted.

The results implied that retail organisations and objectives of e-commerce retail consumer purchase are statistically dependent. Objectives of e-commerce retail consumer purchase were differentiated by comparison groups in retailing. The distribution of the observed number of objectives of e-commerce retail consumer purchase differed significantly among retail organisations.

**Table 5: Objective of e-commerce**

Objectives of the e-commerce retail consumer purchase	Apparel sector (n=180)	Food & Grocery sector (n=155)	Consumer durable sector (n=140)	Entertainment sector (n=105)	Overall Rank (n=580)
Customer centric Outcomes	1 (86)	1 (73)	1 (71)	2 (21)	1 (251)
Operational Optimization	3 (24)	2 (36)	2 (28)	1 (53)	2 (141)
Financial Management	2 (33)	4 (16)	3 (19)	3 (14)	3 (82)
Risk Management	4 (20)	5 (12)	4 (14)	4 (9)	4 (55)
New Business Model	5 (17)	3 (18)	5 (8)	5 (8)	5 (51)

**H4<sub>0</sub>: There is no mean difference of opinion among retail organisations on major obstacles in adopting e-commerce retail consumer purchase.**

**H4<sub>a</sub>: There is significant mean difference of opinion among retail organisations on major obstacles in adopting e-commerce retail consumer purchase.**

To test the above hypothesis, On-way MANOVA is used. The overall test of the One-way multivariate analysis of variance relationship shown in Table 4.40 was rejected at the 0.05 significance level (Pillai's Trace= 0.440,  $F [33, 1704] = 8.868$ ,  $p=0.001$ ; [Wilk's Lambda = 0.608,  $F [33, 1668.244] = 9.311$ ,  $p=0.001$ ; Hotelling's Trace= 0.570,  $F [33, 1694] = 9.756$ ,  $p=0.001$ ). The results indicated that all three tests were significant. The decision was made that the differences did exist among retail organisations on major obstacles in adopting e-commerce retail consumer purchase, and further testing was needed. In table 5 presented about multivariate analysis of retail organization and obstacles in e-commerce.

**Table 5: One-way Multivariate analysis of variance between retail organization and obstacles in adopting e-commerce**

Effect	Value	F	Hypothesis df	Error df	Sig. (p-value)	
Intercept	Pillai's Trace	0.990	4889.323 <sup>b</sup>	11.000	566.000	0.000

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	Wilks' Lambda	0.010	4889.323 <sup>b</sup>	11.000	566.000	0.000
	Hotelling's Trace	95.02	4889.323 <sup>b</sup>	11.000	566.000	0.000
	Roy's Largest Root	95.02	4889.323 <sup>b</sup>	11.000	566.000	0.000
Type of retail organization	Pillai's Trace	0.440	8.868	33.000	1704.000	0.000
	Wilks' Lambda	0.608	9.311	33.000	1668.244	0.000
	Hotelling's Trace	0.570	9.756	33.000	1694.000	0.000
	Roy's Largest Root	0.407	21.037 <sup>c</sup>	11.000	568.000	0.000
a. Design: Intercept + Type of retail organization						
b. Exact statistic						
c. The statistic is an upper bound on F that yields a lower bound on the significance level.						
d. Computed using alpha = .05						

Source: Primary data

To determine how the dependent variables, differ for the independent variable, the Univariate ANOVA tests were conducted for each dependent variable. The results (tests of between-subjects effects) revealed that there was significant effect ( $P < 0.005$ ) of retail organisation groups on major obstacles except insufficient infrastructure and lack of internal skills ( $p > 0.053$ ) in adoptinge-commerce retail consumer purchase.

Further Tukey's HSD post-hoc tests were conducted to follow up the significant ANOVAs identified in tests of between- subjects effects. By and large, the multiple comparisons table reveals that mean difference among retail groups for major obstacle in adoptinge-commerce retail consumer purchase was statistically significant ( $p < 0.05$ ) except in some cases where p-value is more than 0.04. The mixed results implied that there are some similarities and differences among retail groups with respect to perceptions ofe-commerce retail consumer purchase.

It was proved that there was significant difference exist among four retail organisations towards major obstacles in adoptinge-commerce analytics. Further, the error variance of the dependent variable was also proved equal across groups among all major obstacles ofe-commerce analytics. Hence, null hypothesis ( $H_{50}$ ) is failed to be accepted and alternative hypothesis ( $H_{5a}$ ) is proved to be accepted for major obstacles in adoptinge-commerce retail consumer purchase. The results implied that there is an association between retail organisation and major obstacles in adoptinge-commerce retail consumer purchase.

***H<sub>50</sub>: There is no mean difference of opinion among retail organisations on challenges in implementinge-commerce retail consumer purchase***

***H<sub>5a</sub>: There is significant mean difference of opinion among retail organisations on challenges in implementinge-commerce retail consumer purchase***

To test the above hypothesis, On-way MANOVA is used. The overall test of the One-way multivariate analysis of variance relationship shown in Table 4.41 was rejected at the 0.05 significance level (Pillai's Trace= 0.318,  $F [24, 1713] = 8.455$ ,  $p = 0.001$ ; [Wilk's Lambda = 0.707,  $F [24, 1650.874] = 8.7238$ ,  $p = 0.001$ ; Hotelling's Trace= 0.379,  $F [24, 1703] = 8.964$ ,  $p = 0.001$ ). The results indicated that all three tests were significant. The decision was made that the differences did exist among retail organisations toward challenges faced by retail organisations in implementinge-commerce retail consumer purchase, and further testing was needed. In table 6 presented about multivariant analysis of retail organization and challenges in implementation ofe-commerce analytics is presented.

**Table 6: One- way Multivariate analysis of variance between retail organization and major challenges in-commerce**

Effect	Value	F	Hypothesis df	Error df	Sig.
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Intercept	Pillai's Trace	.968	2169.12 b	8.000	569.00	.000
	Wilks' Lambda	.032	2169.12 b	8.000	569.00	.000
	Hotelling's Trace	30.497	2169.12 b	8.000	569.00	.000
	Roy's Largest Root	30.497	2169.12 b	8.000	569.00	.000
Retail organization	Pillai's Trace	.318	8.45	24.000	1713.00	.000
	Wilks' Lambda	.707	8.72	24.000	1650.87	.000
	Hotelling's Trace	.379	8.96	24.000	1703.00	.000
	Roy's Largest Root	.254	18.14 <sup>c</sup>	8.000	571.00	.000
a. Design: Intercept + Retail organization						
b. Exact statistic						
c. The statistic is an upper bound on F that yields a lower bound on the significance level.						
d. Computed using alpha = .05						

Source: Primary data

To determine how the dependent variable differs for the independent variables, the Univariate ANOVA tests were conducted for each dependent variable. The results shown (tests of between-subjects effects) revealed that there was significant effect ( $P < 0.005$ ) of retail organisation groups on major challenges except inadequate analytics resources, poor data quality and outdated software and tools ( $p > .053$ ) in implementing e-commerce retail consumer purchase.

**H6<sub>0</sub>:** *There is no difference in impact of e-commerce analytics technology on business processes among retail organisations.*

**H6<sub>a</sub>:** *There is significant difference in impact of e-commerce analytics technology on business processes among retail organisations.*

To test the above hypothesis, Chi-square statistic is used for testing difference/ association between e-commerce technology and business processes of retail organisations. The Chi-square statistic results ( $\chi^2 = 25.12$ , df 15,  $p < 0.05$ ) shown in Table 8 reveals that there is significant difference in the distribution of responses to impact of e-commerce analytics technology on business processes among the comparison groups (i.e., four types of retail organisations). Thus, null hypothesis (H6<sub>0</sub>) is failed to be accepted. It means alternative hypothesis (H6<sub>a</sub>) is accepted.

**Table 8: Retail Business Benefits**

Business processes that e-commerce technology can have the greatest impact	Apparel sector (n=180)	Food & Grocery sector (n=155)	Consumer durable sector (n=140)	Entertainment sector (n=105)	Total (n=580)
Customer-centric merchandising	1 (52)	1 (48)	1 (41)	1 (32)	1 (173)
Targeted offers and promotions	2 (46)	3 (27)	3 (26)	3 (18)	2 (117)
Demand forecasting and supply chain modelling	3 (30)	4 (21)	2 (35)	2 (27)	3 (113)
Loyalty program Management	4 (24)	2 (36)	4 (17)	4 (17)	4 (94)
Store design	5 (16)	5 (14)	5 (16)	5 (6)	5 (52)

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Loss prevention	6 (12)	6 (9)	6 (5)	6 (5)	6 (31)
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The results implied that business processes in retail organisations are highly impacted by e-commerce analytics technology. It means that there is significant association between the two variables. The statistically significant difference proves a causal relationship between two variables.

**H9<sub>0</sub>: Deployment of e-commerce analytics will not mediate the relationship between customer process and customer acquisition in retail organisations**

**H9<sub>a</sub>: Deployment of e-commerce analytics will not mediate the relationship between customer process and customer acquisition in retail organisations**

To test the above hypothesis, simple linear regression analysis is used to estimate the mediating effect of deployment of e-commerce analytics on the relationship between customer process and customer acquisition. The resulting regression models for customer acquisition with customer process mediated by e-commerce analytics is statistically significant [ $F(2,577) = 5.809, p = 0.003$ ]. The results shown in ANOVA Table 7 indicate that independent variable such as customer process and mediating variable e-commerce analytics are related to dependent variable (i.e., customer acquisition). The model summary of regression model for customer acquisition shown in Table 8 contributed marginally and predicted 1.6 percent variation by customer process and mediating variable e-commerce analytics.

**Table 7: ANOVA statistics for customer process, moderating variable (big data analytics) and customer acquisition**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	28.276	2	14.138	5.809	.003 <sup>b</sup>
	Residual	1404.240	577	2.434		
	Total	1432.516	579			
a. Dependent Variable: customer acquisition						
b. Predictors: (Constant), Mediator (big data analytics), customer process						

Source: Primary data

**Table 8: Model summary for regression model**

Model Summary									
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	.140 <sup>a</sup>	.020	.016	1.560	.020	5.809	2	577	.003
a. Predictors: (Constant), Mediator (big data analytics), Customer service									

Source: Primary data

The coefficient summary for evolved regression models shown in Table 9 revealed that customer process ( $\beta = 0.207, t = 3.085, p = 0.005$ ) and mediating variable e-commerce analytics ( $\beta = 0.190, t = 2.113, p = 0.05$ ) were the significant predictors for customer acquisition in retailing organisations. Thus alternative hypothesis (H12<sub>a</sub>) is accepted.

**Table 9: Coefficient summary for regression model**

Model		Unstandardized Coefficients		Standardize Coefficients	t-value	Sig. (p-value)
		B	Std. Error	Beta		
1	(Constant)	2.349	0.286		8.213	0.000
	Customer process	0.207	0.067	0.133	3.085	0.05
	Mediator (Big data analytics)	0.190	0.058	0.086	2.113	0.05
a. Dependent Variable: customer acquisition						

Source: Primary data

Although the regression modal was significant, the mediating role of e-commerce analytics between customer process and customer acquisition is significant but not strong. Overall, the results indicate that null hypothesis (H<sub>0</sub>) is failed to be accepted and alternative hypothesis (H<sub>a</sub>) is proved to be accepted. It indicates that there is a need to improve the effective use of e-commerce analytics in customer acquisition process.

**H<sub>10</sub>: Retailers’ customer acquisition will not increase as their e-commerce retail consumer purchase deployment increase.**

**H<sub>10a</sub>: Retailers’ customer acquisition will increase significantly as their e-commerce retail consumer purchase deployment increase.**

To test the above hypothesis, simple linear regression analysis is used to estimate the influence of e-commerce retail consumer purchase on customer acquisition. The resulting regression model for customer acquisition with e-commerce analytics is statistically significant (F (1,578) =83.650, p=0.001). The regression modal summary results shown in Table 10 indicate that independent variables are related to dependent variable, and predicted by 12.6 percent variation by e-commerce analytics in customer acquisition.

**Table 10: Regression modal summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. Change
1	0.356 <sup>a</sup>	0.126	0.125	1.127	0.126	83.650	1	578	0.000
a. Predictors: (Constant), e-commerce analytics									

Source: Primary data

The coefficient summary for evolved regression models shown in Table 10 revealed that e-commerce analytics (β=0.320, t=9.146, p=0.005) had significant influence on customer acquisition in retailing organisations. Thus alternative hypothesis (H<sub>10a</sub>) is accepted.

**Table 11: Coefficient summary for regression model**

Model	Unstandardized Coefficients	Standardized Coefficients	t-value	Sig. (p-value)
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		B	Std. Error	Beta		
1	(Constant)	2.230	0.107		20.826	0.000
	Big data analytics	0.320	0.035	0.356	9.146	0.000

a. Dependent Variable: customer Acquisition

Source: Primary data

The results disproved the null hypothesis (H10<sub>0</sub>) and accepted alternative hypothesis (H10<sub>a</sub>) that the increase of deployment of e-commerce analytics significantly increase the customer acquisition in retailing.

**H11<sub>0</sub>: Retailers’ customer retention will not increase as their e-commerce retail consumer purchase deployment increase.**

**H11<sub>a</sub>: Retailers’ customer retention will increase significantly as their e-commerce retail consumer purchase deployment increase.**

To test the above hypothesis, simple linear regression analysis is used to estimate the influence of e-commerce retail consumer purchase on customer retention. The resulting regression model for customer retention with e-commerce analytics is statistically significant (F (1,578) =158.608, p=0.001). The regression model summary results shown in Table 12 indicate that independent variables are related to dependent variable, and predicted by 21.3 percent variation by e-commerce analytics in customer retention strategies.

**Table 12: Regression model summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. Change
1	.464 <sup>a</sup>	.215	.214	.399	.215	158.608	1	578	.000

a. Predictors: (Constant), e-commerce retail consumer purchase

Source: Primary data

The coefficient summary for evolved regression models shown in Table 13 revealed that e-commerce retail consumer purchase ( $\beta=0.169$ ,  $t=12.594$ ,  $p=0.0015$ ) had significant influence on customer retention in retailing organisations.

**Table 13: Coefficient summary for regression model**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig. (p-value)
		B	Std. Error	Beta		
1	(Constant)	1.352	0.051		26.547	0.000
	Big data analytics	0.169	0.013	0.464	12.594	0.000

a. Dependent Variable: Customer Retention

Source: Primary data

The results failed to accept null hypothesis (H11<sub>0</sub>). The alternative hypothesis (H11<sub>a</sub>) is proved to be accepted that the increase of deployment of e-commerce analytics significantly increase customer retention in retailing.

## V. DISCUSSION

The present findings contribute to the better understanding of e-commerce analytics in retailing in India, an area that has received scant attention within the academic literature. From the findings, it is evident that retailers in India are not using e-commerce analytics, due to the lack of an obvious use case to justify the implementation costs. Furthermore, the study has shown a debate around the definition of e-commerce analytics, as well as a multitude of conflicting perceptions on the concept. The findings showed that retail organisations are not very serious toward using e-commerce analytics because there is a focus on exploiting existing structured data completely before tapping into unstructured and semi structured data. Some retailers are, however, leveraging the enhanced processing speeds of e-commerce analytic products to improve on traditional analytics. Thus, this research encourages retailers to change their beliefs about e-commerce retail consumer purchase, and it also encourages academics to further explore the antecedents and impact of e-commerce analytics in the retailing industry. The overall results of this study show that there is no difference among four retail organizations in relation to important parameters, important elements of e-commerce analytics. However, 'veracity of e-commerce' and 'technology of e-commerce analytics' are emerged as the most important parameter and element of e-commerce retail consumer purchase respectively. The results underline the extreme importance of e-commerce retail consumer purchase across four retail organizations albeit they are not very serious of using e-commerce analytics as less than adequate access to relevant, accurate and timely e-commerce as well as availability of e-commerce analytics capabilities in retail organizations. The statistical results also highlighted customer centric outcomes and operational optimizations are the most sought after objectives of e-commerce retail consumer purchase across four retail organizations. It is understood that desired 217 outcomes of e-commerce retail consumer purchase are customer engagement/experience management and optimizing retail operations. The statistically significant findings emphasized that understanding customers by establishing a single view across multiple sources of customer information (point-of-sale, loyalty program, social media, etc.) is the key challenge, apart from other three challenges, needs to be addressed across four retail organizations. The study also identified twelve major obstacles in adopting e-commerce retail consumer purchase in retail organizations. Out of which, 'lack of understanding of how to use data analytics to improve the business' is the major obstacle in adopting e-commerce retail consumer purchase. It is understood that e-commerce analytics has not been integrated with the organisational vision and mission as seriousness toward the use of e-commerce analytics is minimal. Supporting the aforesaid findings, the findings emphasise delivery of insights to the right resource at the right time is the key challenge that prevents retailers from implementing e-commerce analytics across four retail organisations. This is due to lack of clearly articulated analytics strategy in retail organisations as it is identified as second challenge in implementation of e-commerce analytics. Furthermore, the results identified and examined that different users and different departments have different ways of measuring the business is the biggest obstacles in getting e-commerce analytics in order to make better data-driven business decisions in retail organisations besides five other biggest obstacles. The statistical findings also underlined the cost and/or complexity of implementing of e-commerce solutions is the obstacle preventing retail organisations from using e-commerce. The findings underline customer and market analysis, followed by product development and management are two major business functions in the retail organisations stand to make the best use of insights from e-commerce retail consumer purchase. In alignment with earlier findings, customer centric merchandising, targeted offers and promotions are the chief business processes immensely benefited from e-commerce analytics in retail organisations. The study identified six kinds of business values of using e-commerce analytics. Out of which, better, fast-based decision making is the ultimate tangible value derived from using e-commerce analytics across four retail organisations.

## VI. CONCLUSION

Consumer retention is key factor in effective development and advancement in any business. This paper evaluated the contribution of e-commerce analytics on the customer analytics and customer retention. The data for analysis of e-commerce analytics on customer retention is evaluated based on primary data collection technique. The collected data were statistically examined for evaluation of customer retention and analytics. The statistically significant findings underscored the influence of e-commerce retail consumer purchase in customer acquisition and retention strategies in retailing. The findings also revealed the mediating role of e-commerce retail consumer purchase in the relationship between customer process and customer acquisition in retailing.

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