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Impact of Mobile Phone Usage on Growth in E-Commerce in India

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Abstract

The emergence of mobile phones having internet connection can be considered as single most factor impacting e-commerce. E-commerce has increased leaps and bounds due smartphones as consumers find it quite easy to conduct online business with the help of handheld device. With regular increase in mobile phone subscribers, it is expected that mobile commerce (m-commerce) is also expected to experience significant growth contributing to overall growth in e-commerce in India. Hence this paper has examined the effect of mobile phone usage on e-commerce in India.

The number of smart mobile phone users have increased from around 250 million in 2015 to close to 700 million in 2020 registering a cumulative growth rate of 178 percent over 6 years with an average growth rate of 30 percent per year. The e-commerce in terms of market size has experienced a cumulative growth rate of 220 percent with an average growth rate of 37 percent per year between 2015 and 2020. The online spending has experienced a cumulative growth rate of 517 percent during the six year period of 2015-2020 with an average growth rate of 86 percent per year. The number of online buyers in India has increased from about 50 million to about 168 million in 2020 with a cumulative growth rate of 238 percent over 6 year period and an average growth rate of 40 percent per year. The correlation and linear regression analysis by the paper concluded that there is strong correlation between use of smart mobile phones and growth of e-commerce in India. The regression analysis indicates that there is a significant positive impact of smart phone users on e-commerce in India.

The area of mobile commerce has huge scope for growth and by improving on certain issues like privacy especially related to monitoring of location, can increase the customer base. The studies have suggested that by addressing the issues such as differing standards in technology across the world, security, small screen, poor internet, lack of convenience, cultural issues and by taking measures such as improving internet speed, size of the mobile phone one can make customers use mobile commerce and promote electronic commerce in a big way in the future.

Keywords- E-commerce, Growth, Impact, Mobile phone, Online spending

1. Introduction

The concept of electronic commerce is usually defined as purchase and sale of goods and services through internet. It also includes transmitting of funds and exchange of data and information. The types of e-commerce transactions cover Business to Business (B2B), Business to Consumer (B2C), Consumer to Business (C2B) and Consumer to consumer (C2C) (Das & Ara, 2015). B2B e-commerce takes place between companies and comprises of two primary components i.e., e-frastructure and e-markets. B2C e-commerce takes place between companies and consumers and involves collecting information, buying of goods etc. C2B transaction occurs when products are sold by consumers over internet platforms to

companies. In C2C e-commerce the products are sold and bought by consumers online (A. Gupta, 2014). The e-commerce market in India is growing at a significant pace. During the past ten to fifteen years the size of e-commerce was only USD 600 million but was expected to grow to USD 9 billion in 2016 and USD 70 billion in 2020. The average annual growth rate between 2012-2016 was estimated to be 57%. The growth of e-commerce is stated to be driven by increased use of internet, growth of smartphone users, growing population and the benefits offered by the companies such as discounts, rebates etc (Panigrahi, Upadhyaya, & Raichurkar, 2016).

The Indian e-commerce industry is stated to have gone through three waves in the last two decades. The first wave occurred in the eighties and nineties with the launch of IT publications and establishment of network of institutions. The first wave was triggered with the introduction of dial-up internet in six cities in 1995 and with other services such as B2B directory, online matrimonial services, online recruitment services etc. The second wave was triggered in early 2005 with the emergence of low cost airlines primarily for online ticketing and online retail. Measures such as use of online travel agents and e-ticketing for IRCTC, emergence of social networking sites have started the second wave. The third wave comprised of the emergence of direct platforms for retail trade during 2010-2013 such as Snapdeal, Flipkart, Jabong and Amazon. The online e-commerce has also attracted funds from investors in a big way during this period. Other related interventions such as e-wallets, one-stop government services and smartphone penetration have caused a huge growth in e-commerce during this period. Thus from 1995- 2010 the e-commerce revenue has grown from 0 to USD 200 million while it has grown from USD 2000 million to USD 8 billion from 2010 to 2015 (Kalia, 2016).

The single most important factor for the evolution and growth of e-commerce was the technology particularly the application of internet for business. It was found that increase in number of internet users' population by 1% has contributed to 1.931% growth in e-commerce between 2005-2015 in India. Other factors impacting e-commerce growth included increase in number of credit card and debit card users and also increase in internet enabled smart devices (Bhowmik, 2017). Studies have found that the benefits from e-commerce accrue due to various features offered by the technological platforms. Some of the key features include security and privacy, trust and loyalty, accessibility and awareness and quality of products and their benefits. Consumers value the security and confidentiality of the e-commerce platforms. Gaining the trust and loyalty of consumers is an important factor for the successful adoption of e-commerce. Consumers tend to use e-commerce platforms more frequently when they perceive low or zero risk with regards to fraudulent behavior. Consumers prefer convenience while conducting transactions on platforms that are well designed and provide easy accessibility. Finally, the quality of products and services offered also impact positively in the adoption of e-commerce (Kabango & Asa, 2015).

These above observations are supported by studies on customer satisfaction with regard to online shopping in India. A prerequisite for customers to use online shopping website is that it should be easy to understand and easy to interact and provides adequate information. Ease of ordering is another factor impacting online shopping. Cash on delivery option gain the trust of customers and encourage e-commerce. The key factors impacting e-commerce are found to be continuous availability of information on the website, ease of user interface, price value, product quality and special benefits such as discounts, warranties, payment options etc. (Tandon & Kiran, 2019)

The emergence of mobile phones having internet connection can be considered as single most factor impacting e-commerce. E-commerce has increased leaps and bounds due smartphones as consumers find it quite easy to conduct online business with the help of handheld device. The importance of use of mobiles in e-commerce can be highlighted from the fact that a new area called m-commerce which is essentially an extension of e-commerce has emerged in recent years. The advantage of m-commerce is that it performs all the tasks related to e-commerce from other devices such as computers at the same time offering additional benefits such as high level of connectivity and accessibility as everyone now owns a mobile phone as a matter of necessity. With regular increase in mobile phone subscribers it is expected that m-commerce is also expected to experience significant growth contributing to overall growth in e-commerce in India (R. Kumar, Rishi, & Kumar, 2013). Use of mobile phones is said to particularly address some of the constraints of e-commerce such as lack of computer knowledge, irregular power supply, high price of computers etc. The number of mobile phone users in India was estimated to be 1.1 billion in 2016 and this is expected to offer high potential for growth of m-commerce (S. Kumar & Kumar, 2017). Hence this paper has examined the effect of mobile phone usage on e-commerce in India.

2. Literature Review

Debesh Bhowmik studied the pattern of retail sales in India and tried to identify the link it has with the credit card and debit card users, growth in GDP and number of people using the internet. The paper observed that e-commerce is one of the fastest growing sectors playing a crucial role in promoting the economies all around the world. The paper identified the relationship between e-commerce and various other factors like internet users, card users and growth rate of GDP. The paper concluded that during the period 2005-20 there was a growth in E-commerce of approximately 42% per year. The paper observed that a small increase in the number of people that use internet contributed to a similar growth in the retail sales of e-commerce. The paper also observed that E-commerce in India could contribute to 4% of the GDP by 2020 provided India improves its security, infrastructure, etc (Bhowmik, 2017).

The paper by Liran Einav et al examined the growth and scope of mobile e-commerce and how it may change e-commerce. The authors analysed the mobile application of eBay wherein they looked at the growth in usage of mobile application of eBay and tried to identify its users. One group of users were those who were already using the eBay regularly as compared to other users. They identified share of mobile usage in different parts of the United states of America and observed that the change in usage is due to change in infrastructure and connections among different states. They observed that the increase in mobile usage was linked to an increase in eBay purchases. They identified that people were using the mobile lower during the day and higher during the evening and at night. They concluded that mobile application was being used mostly for commodity items. Majority of mobile aspects were same as that of non-mobile aspects with the only difference being that mobile was used more for browsing. They concluded that it is possible that increase in mobile phone use could lead to usage of other new technologies and overall, it could have a significant impact on the e-commerce sector (Einav, Levin, Popov, & Sundaresan, 2014).

Indrajit Ghosal et al studied the effect of various factors on the adoption of e-commerce. The paper looked at factors like technology, convenience etc to understand consumer attitudes towards e-commerce. The objectives of the study were to find the current situation of e-commerce in India, and study how much e-commerce has contributed to the Indian economy. The data for the study was collected from the survey of consumers. The paper used factor analysis method to eliminate few variables that are not necessary. The survey was done through a questionnaire sent to about two hundred people. The paper identified factors like economy, business environment, security etc. as some of the most important factors. They concluded that the means of using e-commerce must be convenient to use and only then it can contribute to the economy. E-commerce is associated with technology and most of the e-commerce is done through sites like Amazon where technology is very important to make use of them. As E-commerce involves online transactions security is of high importance to protect the customers' payment history and details from fraud and theft (Chatterjee & Ghosal, 2015).

The paper by Kumar Anuj et al looked at the importance of the e-commerce to the economy of India. The objectives of this study were to provide the patterns of e-commerce in India and the schemes that contributed to growth of e-commerce in India. The method used to collect data was from various secondary sources. The research was descriptive and exploratory in nature. The data collected from secondary sources was analysed and presented in the form of tables, pie-charts etc. The data analysis technique used was the spearman rank correlation and Pearson correlation. The paper also looked at the internet penetration in India and concluded that increase in availability of internet services contributed to increase in e-commerce. This paper tried to find the relationship between literacy rate and e-commerce and found that there was a positive relationship between the two. The paper found that there was a negative correlation between e-commerce and unemployment. The paper concluded that e-commerce played an important role in the economy and there is an increase in usage of e-commerce. The paper found that after demonetization there was a shift to online retail. The paper concluded that there is a need to increase the awareness among people of rural areas about e-commerce and also to provide and enhance proper security features of the technologies to prevent malpractices (Anuj, Fayaz, & Kapoor, 2018).

Rakhi Thakur et al conducted empirical study on customer usage of mobile commerce in India. The researchers looked at mobile commerce from the point of view of new technology adoption. The paper also looked at consumer understanding of risk while predicting whether consumers are ready to use m-commerce. The paper observed that people are reluctant to use mobile phones and tried to find out the factors responsible for preventing the customer from using mobile phones to their full potential. The paper used a new model called technology acceptance model and performed a second generation technique of

SEM. Data was collected in the form of questionnaires that were mailed to people who were working professionals. The paper found that the risk and behaviour intention were negatively related which meant that customers were worried about safety and security of using online services through mobile platforms. The paper concluded that in order to increase the mobile commerce usage there is a need to reduce the risk factor which can be done by proper encryption, authentication and by protecting the privacy of the customers (Thakur & Srivastava, 2013).

Sumanjeet studied the impact of e-commerce on various aspects of economy like agriculture, taxation etc. The paper observed that due to technological differences between developed and developing countries the gap between them may increase because of growth in e-commerce as developing countries cannot keep up with the developed countries. Constant growth of e-commerce is supposed to have a considerable impact on different levels of economy. E-commerce is expected to have a good impact on agriculture, though it is not easy to use e-commerce within agriculture. This paper observed that it is difficult to analyse the effect of e-commerce on agriculture and various parties associated with it. E-commerce is expected to have a good impact on labour and one of the reasons could be the presence of online job portals. The impact of e-commerce on taxation is considerable but it remains to be seen how it will be adopted in India. E-commerce has helped to create e-payment methods, but they come with their own risks. This paper concluded that E-commerce would provide many benefits and cause few problems (Sumanjeet, 2011).

Jayanti Goyal analysed the good and the bad of e-commerce and the future of e-commerce. This paper looked at the scope of e-commerce in India and concluded that the patterns of e-commerce are aligned with those of the rest of the world. Due to digital marketing, e-commerce is expected to grow in the near future. Creation of e-payment methods has helped fuel the growth of e-commerce. Technological advancements have helped to promote the use of e-commerce. The increase in usage of e-commerce is closely linked to the increase in use of internet. Sufficient internet facilities must be available for convenience. Security and privacy are two more concerns. This paper concluded that while India recognizes the importance of e-commerce it still needs to provide sufficient technological infrastructure and legal guidelines to check the movement of trade (Goyal, 2015).

Sanjay Narayan Sinha et al studied the growth of e-commerce in India and the challenges it is facing. The methodology of this paper is explanatory and conceptual and has gathered the data from different secondary sources. This paper identified quite a few challenges faced by the e-commerce sector. One of them was the language gap wherein customers were not familiar with the English language and faced difficulties. Lack of proper internet infrastructure was another issue identified. Also, security and privacy were few of the other concerns. Fear of losing the data, lack of good encryption, getting hacked were few of the other concerns. Implementing high taxes in certain areas will prevent the usage of e-commerce. Another issue identified was the lack of proper customer support. The paper looked at trends of e-commerce and concluded that it is expected to grow steadily. There have been significant investments from foreign companies and the Indian government has taken various steps to help promote the growth of e-commerce in India. The paper concluded that e-commerce has a lot of scope for growth in the future and is expected to increase employment and exports (Sanjay Narayan Sinha, Dr. Goutam Tanty, & Panigrahi, 2019).

Nisha Chanana et al looked at the various elements that are essential for rise of e-commerce and all the various parties that are affected by it. This paper observed that cheap computers, existing internet users will help increase the use of e-commerce. Many Indian websites have changed to e-commerce from traditional methods. The paper observed that even in the presence of tough RBI rules companies have still found a way to sell various items ranging from groceries to computers. With the increase in the rate of internet users and penetration into the country it is expected that businesses will look to shift to e-commerce. Customers are switching to online mode because the products available are cheaper. Retailers and producers are going to benefit the most from e-commerce while distributers are expected to be hit the most. General public is also expected to gain a lot because of the many benefits provided by e-commerce. Key issues like quality of the goods, legal rules, shipping options etc, could prove to be key factors for driving the e-commerce. Overall, this paper concluded that the growth of e-commerce in India will be huge if all the necessary steps are taken (Chanana & Goele, 2012).

Mahipal and Shankaraiah presented the different phases of e-commerce and how e-commerce has changed through these phases. This paper observed that the first phase of e-commerce began in 1995 in India. This phase included the first marital website, the first directory for business to business trade and included the initial stages of job hiring through online websites. This phase had very few internet users, slower internet and people were not ready to perform online activities. After a period of slow growth, the second phase began, and it included air travel, online shopping, and social media. This study used secondary data from previous studies and the data analysis was done using the formulas for simple growth rate and CAGR. According to a report cited by the paper e-commerce in India can be segregated into travel and non-travel industries. The travel part included various online travel sites that are used to browse and book tickets and hotels. The non-travel part included areas of online matrimony sites, retail sites used for buying various products like clothes, games, bill payment sites and various other sites. The paper analysed the changes in the share of these segments and concluded that while online travelling decreased other areas had seen a rise. The study concluded that if legal rules are formulated for e-commerce and trade is allowed to expand then there will be a rise in e-commerce (Mahipal & Shankaraiah, 2018).

The paper by Chandan Gupta et al looked at the present scenario of the mobile commerce and the challenges faced by it. The objective of the study was to find out the extent of penetration of m-commerce and to identify the challenges faced by it. The paper looked at the scope of mobile phones and observed that they are present everywhere and hence m-commerce can be used in many areas. The paper observed that that people were not aware of mobile commerce and refrained from using it in the initial years and preferred offline purchases. People were not comfortable with the websites and one of the reasons was that not everyone was well versed in English language. Other issues related to mobile commerce were lack of availability of appropriate internet resources and concerns regarding the safety and privacy of the information. This paper examined the future of mobile commerce and observed that use of m-commerce will increase but the security aspect needs to be addressed. The paper concluded that India is on the right path to increase the use of mobile commerce and that by addressing the issues identified in the paper it can lead to faster growth (C. Gupta, Chandhok, & Gupta, 2016).

Yuzhi Cao et al studied the distinguishing factors between m-commerce and e-commerce and analysed them. The paper observed that there is a difference between availability of online shopping services and their usage by customers. This paper tried to identify differences between online and mobile commerce from the customer point of view. The paper identified two main categories namely technology and value and based on them tried to distinguish electronic commerce and mobile commerce. This paper used questionnaire to gather the data. Responses were gathered through an online survey and were then tested for validity and reliability. The analysis method used were logit regression model. The paper identified that there is a difference in perception with regard to device and communication network. If consumers thought that the mobile devices are convenient to use, then it will promote mobile commerce. The paper suggested that by taking measures such as improving internet speed, size of the mobile phone one can make customers to switch to mobile commerce from electronic commerce. The paper suggested that mobile use can be improved by providing desired results to the customers. There is a negative effect of risk perception i.e., there is a concern regarding the safety of consumer data. The paper concluded that these findings help us to understand the perception of the consumer with regard to m-commerce and e-commerce (Cao, Lu, Gupta, & Yang, 2015).

The paper by Siau Keng et al analysed the values of mobile commerce. The paper tried to identify the perception of customers with regards to mobile commerce and the customer expectations from it. The paper used a work system framework and identified four different systems associated with mobile commerce. The values associated with mobile commerce are derived directly by understanding the values of the customers or end user that use mobile commerce. This is called as a value focused thinking. The data was collected in the form of interviews. The respondents were interviewed for an hour. The question ranged from normal question to specific questions. The answer to the questions were then separated to identify the means objectives. The quality of the product is identified as a key factor having effect on customer perception. The paper identified security, privacy, convenience, efficiency etc as other factors having effect on customer in perception. By improving the performance of these factors customers can be encouraged to use mobile commerce (Siau, Sheng, & Nah, 2004).

Julia Yeo and Wayne Huang identified the various models that can be used in mobile commerce. The paper observed that mobile phones increase the connectivity and accessibility and help customers to access products and services. The paper looked at the role of technology and observed that mobile commerce apps were used in ERP system in Singapore. Mobile commerce is also being used in japan successfully. The paper identified some of the issues faced by the mobile commerce. These include differing standards in technology across the world, security, small screen, poor internet, lack of convenience and cultural issues. This paper used a SWOT analysis to determine the landscape of mobile commerce in the future. The strengths were that it could perform from anywhere but at the same time the weaknesses were poor internet, security and privacy. Improving existing facilities is an opportunity while competition is a threat. It applied Porter's five forces to identify various issues surrounding mobile commerce. The paper concluded that the area of mobile commerce has huge scope for success and by improving on certain issues like privacy specially related to monitoring of location, it can increase customers (Yeo & Huang, 2003).

Ngai and Gunasekaran analysed various articles and papers on mobile commerce and tried to understand various issues related to it. The aim of the paper was to provide a better understanding of the field of mobile commerce. The paper looked at various fields like marketing, information technology information systems to collect all the articles and papers on mobile commerce and present them in one single space. The criteria for selection of papers were the nature and the importance of the research conducted and to collect data from various papers, unpublished works, textbooks etc. The research collected was then classified into theory and research, network infrastructure, middleware, user interface and the benefits and uses of mobile commerce. The paper concluded that although the research done on mobile commerce until then was not detailed there is hope that it is going to increase in the future. The paper after reviewing close to one hundred and forty-nine articles observed that most of the articles dealt with the theory of mobile commerce. The paper observed that there is a need to improve the interface of the mobiles according to the requirements. The paper noted that the most used mobile commerce applications were the finance related applications, and that the entertainment and gaming related applications were expected to grow. The paper suggested for using the RFID technology to increase the usage of mobile commerce (Ngai & Gunasekaran, 2007).

The paper by Barnes analysed how value creation happens with the usage of mobile commerce. The paper tried to identify the important groups involved and the technologies that form a part of this value chain. The paper also analysed some of the important factors that can influence the behaviour of the customer whether to use or not to use mobile commerce services. The paper used the framework developed by the European Commission for this analysis. The paper concluded that the combination of wireless services and the internet will open up new and interesting options for the growth of mobile commerce. The paper looked at how value is added, and the different important players and technologies involved in the growth of mobile commerce. The findings were presented as a value chain analysis. The paper also guessed as to what the future of mobile commerce might be. New technological modes like GPRS and imode are expected to drive the mobile commerce. In spite of these advantages there are still certain issues that need to be addressed to make the customer switch to mobile commerce. Technologies related to location-specific features can act as a key to adding to the value of m-commerce. The paper concluded that the coming years would be very crucial for the growth and development of mobile commerce (Barnes, 2002).

Abhijit Mitra reviewed the current status of e-commerce in India. The paper analysed the various parameters that determine the growth of electronic commerce and the current trends of electronic commerce in the country. The paper looked at how some websites provided all the products in one place whereas there are websites that are dedicated to specific goods and services. Data directories and banks have been identified as the two main factors that help drive the use of electronic commerce. The paper looked at current trend and came to the conclusion that although India was lagging behind countries like the United states of America and the United Kingdom there is growing demand for better services and products at relatively cheaper prices. The issues identified by the paper that surrounded the field of electronic commerce were logistics, vendor management, taxation etc. The paper concluded that electronic commerce has revolutionised the way business is done around the world. Geographic differences are becoming meaningless. With the increased use of 3G and 4G services electronic commerce is expected to grow even further and governments need to take the necessary steps to protect the interests of the customers (Mitra, 2013).

The paper by Harjot Kaur and Daljit Kaur presented the various issues faced by e-commerce or electronic commerce in India. The paper analysed the situation of electronic commerce through the point of view of various players. The paper highlighted that producers benefitted from the electronic commerce as they could market and sell their goods and services directly without any intermediaries. Distributers could shift their business to online mode to work with the reputed producers. Retailers could provide additional information about their product by advertising through websites that are frequently visited. Lastly, people could obtain these products from the comfort of their home. The paper identified that issues like security, targeting of customers and lack of awareness of the online retail market are some of the issues challenging the growth of electronic commerce. Cash on delivery feature was found to cause problems to the companies because it increased their costs. Convenience and transparency were identified as few of the key factors affecting the decisions of the customers. Implementation of location-based services and many payment methods will help increase the growth of e-commerce. The paper concluded that e-commerce provided many benefits in various fields and has the potential for growth (Kaur & Kaur, 2015).

3. Methodology and Data

3.1 Problem Identification

It is very important to encourage and promote the growth of E-commerce in India because it contributes to economic growth and provides convenience and comfort to customers. There are many factors that contribute to the growth of E-commerce and use of mobile phones is considered as an important factor. It is of utmost importance to understand the relationship between use of mobile phones and growth of E-commerce in Indian context.

3.2 Formulation of Research Question

The paper formulated and attempted addressing the following research question:

“How did increase in mobile phone usage in the last 5 years impact the growth of E-commerce in India?”

3.3. Research Objectives

The following are the research objectives

1. To analyze and present the trends in growth of mobile phone usage in India
2. To analyze and present the trends in growth of E-commerce in India
3. To examine and assess based on the data the impact of increase in mobile phone usage on E-commerce in India
4. To draw conclusions based on the analysis

3.4 Hypothesis

H_0: There is no significant impact of increase in use of smartphones on the growth of e-commerce in India.

H_1: There is significant impact of increase in use of smartphones on the growth of e-commerce in India.

3.5 Methods and Sources of Data Collection

The paper is empirical in nature. The data trends were presented in tabular form. Following analysis of data trends, correlation and regression were performed. Pearson correlation and linear regression methods were used for data analysis. SPSS software was used to perform data analysis.

Secondary data was collected for the period 2015-2020 on e-commerce and mobile phone users from authentic and reputable sources. The type and source of data are as follows:

E-commerce data in terms of market size was collected from the source:

https://www.statista.com/statistics/792047/india-e-commerce-market-size/

Data on online spending and online buyers was collected from Forrester research online retail forecast,2015-2020, Asia-Pacific cited in source:

https://www.business-standard.com/article/companies/forrester-sees-75-bn-e-commerce-biz-by-2020-116030500012_1.html

The data on number of smartphone users in India was collected from the source:

https://www.statista.com/statistics/467163/forecast-of-smartphone-users-in-india/#:~:text=The%20number%20of%20smartphone%20users,3.8%20billion%20users%20in%202021.&text=The%20number%20of%20smartphone%20users%20worldwide%20is%20projected%20to,nearly%202.7%20billion%20by%202019

The data adjustments were made with regard to e-commerce market size for the years 2016 and 2019 as the data was not provided. The 2016 and 2019 data was calculated based on the average growth rate of the previous years 2015 and 2018 respectively.

4. Data Analysis and Results

4.1 Analysis of Growth Trends in E-Commerce and Smart Phone Users

The paper has collected the data on growth of mobile phone users in India over the period from 2015 to 2020. The number of smart mobile phone users have increased from around 250 million in 2015 to close to 700 million in 2020 registering a cumulative growth rate of 178 percent over 6 years with average growth rate of 30 percent per year (Table 1).

Table 1: Growth of Mobile Phone Users in India

Year	no. of smartphone users in millions	growth rate
2015	250.66	103.29
2016	304.51	21.48
2017	394.82	57.51
2018	479.34	21.40
2019	634.58	32.39
2020	696.07	45.21

Source: www.statista.com

The growth of e-commerce was analysed in terms of the market size in billions in US dollars. There were data gaps in e-commerce volumes for the years 2016 and 2019. These data gaps were filled by assuming the previous year growth rates. For example, for the year 2016, it was assumed that the increase in market size was about 42 percent as experienced by the year 2015. Similarly, the market size for the year 2019 was estimated to grow by 28 percent over 2018 as experienced between 2017 and 2018. It can be seen from the table below that the e-commerce has experienced a cumulative growth rate of 220 percent with an average growth rate of 37 percent per year between 2015 and 2020 (Table 2).

Table 2: Growth of E-commerce in India

Year	Market size in billions in USD	growth rate
2015	20	42.85
2016	28	42.85
2017	39	95.00
2018	50	28.21
2019	64	28.21
2020	64	0.00

Source: www.statista.com

The paper has used other types of data as proxy indicators for e-commerce growth in India. One such indicators is the projections on growth of online spending in India. It can be seen from the table that the online spending has increased from about 12 billion US dollars in 2015 to about 75 billion US dollars in 2020. This indicates a cumulative growth rate of 517 percent during the six year period of 2015-2020 with an average growth rate of 86 percent per year (Table 3).

Table 3: Growth of Online Spending in India

Year	Online spending (in billion USD	Percentage
2015	12.1	-
2016	22.7	87.60
2017	35.2	55.07
2018	48.9	38.92
2019	62.8	28.42
2020	74.7	18.95

Source: Forrester research online retail forecast,2015-2020, Asia-Pacific cited in source: https://www.business-standard.com/article/companies/forrester-sees-75-bn-e-commerce-biz-by-2020-116030500012_1.html

The data on growth of online buyers was also analysed. It can be seen from the table the number of online buyers in India has increased from about 50 million to about 168 million in 2020. This indicates a cumulative growth rate of 238 percent over 6 year period with an average growth rate of 40 percent per year (table 4).

Table 4: Growth of online buyers in India

Year	online buyers in millions	percentage
2015	49.6	-
2016	67.5	36.08871
2017	90.1	33.48148
2018	116.3	29.0788
2019	142.9	22.87188
2020	167.8	17.42477

Source: Forrester research online retail forecast,2015-2020, Asia-Pacific cited in source: https://www.business-standard.com/article/companies/forrester-sees-75-bn-e-commerce-biz-by-2020-116030500012_1.html

4.2 Analysis and Results of Correlation and Linear Regression

It is proposed to undertake correlation and regression analysis by taking number of smart mobile phone users in millions as independent variable and each of the variables related to e-commerce namely the market size in billions in USD, online spending in billions in USD and online buyers in millions as the dependent variables. The analysis was done between the number of mobile phone users as independent variable and each of the e-commerce variables as dependent variable.

4.2.1 Correlation and Regression Analysis between Smart Mobile Phone Users and Market Size for E-commerce

Correlations

		ecommerce	Smartphone users
Ecommerce	Pearson Correlation	1	.986**
	Sig. (2-tailed)		.000
	N	6	6
Smartphone users	Pearson Correlation	.986**	1
	Sig. (2-tailed)	.000	
	N	6	6

**. Correlation is significant at the 0.01 level (2-tailed).

Correlation was performed between e-commerce and smartphone users. The significance value came out to be 0.000 which indicates that we can reject null hypothesis and accept alternate hypothesis. The Pearson correlation coefficient was found to be r=0.986 as per the above table, which indicates that there is strong correlation between e-commerce and smartphone users.

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-2655.325	4207.259		-.631	.562
	Smartphone users	101.788	8.623	.986	11.804	.000

a. Dependent Variable: ecommerce

Linear regression was performed between e-commerce and smartphone users. The dependent variable was taken as the e-commerce market size and the independent variable was taken as smartphone users. The results from the above table show a significance value of 0.000 which indicates that we can reject null hypothesis and accept alternate hypothesis. This indicates that there is significant impact of smartphone users on e-commerce. This relationship can be given by the linear regression equation which is of the form y = a +bx. From the above table the regression equation can be taken as,

e-commerce = -2655.325 + 101.788(smartphone users)
This means for everyone unit change in the smartphone users the e-commerce value will change by 101.788 units

4.2.2 Correlation and Regression Analysis between Smart mobile Phone Users and Online Spending

Correlations

		Online spending	Smartphone users
Online spending	Pearson Correlation	1	.994**
	Sig. (2-tailed)		.000
	N	6	6
Smartphone Users	Pearson Correlation	.994**	1
	Sig. (2-tailed)	.000	
	N	6	6

**. Correlation is significant at the 0.01 level (2-tailed).

Correlation was performed between online spending and smartphone users. The significance value came out to be 0.000 which indicates that we can reject null hypothesis and accept alternate hypothesis. The Pearson correlation coefficient was found to be r=0.994 as per the above table, which indicates that there is strong correlation between online spending and smartphone users.

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-18629.440	3498.101		-5.326	.006
	Smartphone users	133.398	7.169	.994	18.607	.000

a. Dependent Variable: online spending

Linear regression was performed between online spending and smartphone users. The dependent variable was taken as the online spending and the independent variable was taken as smartphone users. The results from the above table show a significance value of 0.000 which indicates that we can reject null hypothesis and accept alternate hypothesis. This indicates that there is significant impact of smartphone users on online spending. This relationship can be given by the linear regression equation which is of the form y = a +bx. From the above table the regression equation can be taken as,
Online spending = -18629.44 + 133.398(smartphone users)
This means for everyone unit change in the smartphone users the online spending value will change by 133.398 units.

4.2.3 Correlation and Regression Analysis between Smart Mobile Phone Users and Online Buyers

Correlations

		Online buyers	Smartphone users
Online buyers	Pearson Correlation	1	.995**
	Sig. (2-tailed)		.000
	N	6	6
Smartphone users	Pearson Correlation	.995**	1
	Sig. (2-tailed)	.000	
	N	6	6

**. Correlation is significant at the 0.01 level (2-tailed).

Correlation was performed between online buyers and smartphone users. The significance value came out to be 0.000 which indicates that we can reject null hypothesis and accept alternate hypothesis. The Pearson correlation coefficient was found to be r=0.995 as per the above table, which indicates that there is strong correlation between online buyers and smartphone users.

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	T	Sig.
1	(Constant)	-10.320	6.079		-1.698	.165
	Smartphone users	.252	.012	.995	20.245	.000

a. Dependent Variable: online buyers

Linear regression was performed between online buyers and smartphone users. The dependent variable was taken as the online buyers and the independent variable was taken as smartphone users. The results from the above table show a significance value of 0.000 which indicates that we can reject null hypothesis and accept alternate hypothesis. This indicates that there is significant impact of number of smartphone users on number of online buyers. This relationship can be given by the linear regression equation which is of the form y = a +bx.

From the above table the regression equation can be taken as, Online spending = -10.320 + 0.252(smartphone users). This means for everyone unit change in the smartphone users the online buyers value will change by 0.252 units.

5. Conclusion

The paper concludes that there is strong correlation between use of smart mobile phones and growth of e-commerce in India. The regression analysis indicates that there is a significant positive impact of smart phone users on e-commerce in India. The Pearson correlation coefficient was found to be r=0.986 between e-commerce and smartphone users which indicates that there is strong correlation. The Pearson correlation coefficient was found to be r=0.994 between online spending and smartphone users which indicates that there is strong correlation. The Pearson correlation coefficient was found to be r=0.995 between smart phone users and online buyers which indicates that there is strong correlation between the two. The results of the linear regression performed between independent variable smart phone users and dependent variables for e-commerce vize market size, online spending and online buyers show a significance value of 0.000 which indicates that we can reject null hypothesis and accept alternate hypothesis which states that there is significant impact of increase in use of smartphones on the growth of e-commerce in India.

Various studies have also highlighted the positive impact of use of mobile phones on e-commerce in India. They observed that mobile phones increase the connectivity and accessibility and help customers to access products and services. Mobile phones promote e-commerce when consumers think that the mobile devices are convenient to use. Studies have shown that the quality of the product is a key factor in promoting e-commerce. The studies identified security, privacy, convenience, efficiency etc as the other factors having effect on e-commerce and by improving the performance of these factors, customers can be encouraged to use mobile commerce. Studies have also identified some of the issues faced by the mobile commerce. These include differing standards in technology across the world, security, small screen, poor internet, lack of convenience and cultural issues. The studies have suggested that by addressing these issues and by taking measures such as improving internet speed, size of the mobile phone one can make customers use mobile commerce and promote electronic commerce. The area of mobile commerce has huge scope for growth and by improving on certain issues like privacy specially related to monitoring of location, it can increase the customer base. The technological advances in future are likely to impact the use of mobile phones in e-commerce. The combination of wireless services and the internet will open up new and interesting options for the growth of mobile commerce. New technological modes like GPRS and imode are expected to drive the mobile commerce and the coming years would be very crucial for the growth and development of mobile commerce.

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