

## **ROLE OF SMARTPHONES WITH THE ADVENT OF M-COMMERCE IN INDIA**

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### **ABSTRACT**

*India has witnessed a dramatic growth in the number of mobile phone users in the recent past. Equally impressive has been the increase in internet access. Although mobiles allow us to stay connected, the convergence of internet access and smartphones has resulted in tectonic shifts in consumer awareness, outlook and behaviour. Smartphones have been rapidly transformed from being just handheld telecommunications devices to being a window to the world and are now a means of expressing one's opinion and individuality. It has also become the new retail storefront. Smartphones are now a daily necessity for most and are used for a wide range of essential activities.*

*E-commerce practices have expanded its uses into the quickly evolving mobile phone industry in the form of M-commerce. M-commerce, which stands for mobile commerce, is a key positive development for businesses and organizations. It has increasingly expanded and plays a prominent role in our life. M-commerce is a new term referring to "any transaction with a monetary value that is conducted via a mobile telecommunications network".*

*M-commerce is becoming a specific kind of e-commerce that is becoming available and attractive with the technological change and that leads to a constant contact between the retailer and the customer. At the same time, new technologies are being developed to allow payments through mobile phone in fast and simple way.*

### **KEYWORDS**

**Smartphones, E-Commerce, M-Commerce, Internet, Technological Change etc.**

### **INTRODUCTION**

The idea of electronic commerce started in the early 1970s. During this time, electronic commerce meant the facilitation of commercial transactions electronically, using technology such as Electronic Funds Transfer (EFT). This technology allows businesses to send commercial documents like purchase orders or invoices electronically. The use of ICT has enabled innovations in the world of business by introducing the concept of electronic commerce or e-commerce. E-Commerce (EC) is the process of buying, selling, transferring or exchanging products or services via computer network. The second of generation of e-commerce was introduced in the 1980s with the acceptance of credit cards, automated teller machines (ATM) and telephone banking.

E-commerce practices have expanded its uses into the quickly evolving mobile phone industry in the form of M-commerce. This means that people can purchase, browse, and sell products over the mobile phone. The next generation of commerce would most probably be mobile commerce or M-commerce. Presuming its wide potential reach, all major mobile handset manufacturing companies are making WAP (Wireless Application Protocol) enabled smartphones and providing the maximum wireless internet and web facilities covering personal, official and commerce requirement to pave the way for M-commerce that would later be very fruitful for them.

Mobile Commerce refers to wireless electronic commerce used for conducting commerce or business through a handy device like cellular phone or Personal Digital Assistant (PDA). It is also said that it is the next generation wireless E-commerce that needs no wire and plug-in devices. Mobile commerce is usually called as 'M-commerce' in which user can do any sort of transaction including buying and selling of goods, asking any services, transferring ownership or rights, transacting and transferring money by accessing wireless internet service on the mobile handset itself.

Now days, the cell phone, on its own or in conjunction with an organizer is used for much more than simply making phone calls. It also acts as a flexible terminal for a huge range of applications. Therefore, the availability of information (weather forecasts, economic data, and news), e-shopping, e-ticketing, e-banking and e-brokerage is greater than ever before, regardless of time or place. The WAP (Wireless Application Protocol) and WML (Wireless Markup Language) open standards mean the Internet's innovative solution strategies can now be applied to mobile telephony too.

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M-commerce is becoming a specific kind of e-commerce that is becoming available and attractive with the technological change and that leads to a constant contact between the retailer and the customer. The possibility of creating mobile apps is also an excellent chance for seller to follow creative marketing strategies. At the same time, new technologies are being developed to allow payments through mobile phone in fast and simple way.

Smartphone has created new dimensions for business in Indian market. It is not only the smartphone sellers enjoying the business but it also created a new area for mobile application developing companies in India, Internet services provider and other sectors of life to utilize the smartphone to gain competitive advantages. There has been an extreme growth in broadband and Internet service providers business in past few years and one of the main reasons for this drastic increase in their business is the ever increasing use of Smartphone's and growth of Smartphone and mobile applications. In a very small duration, a huge number of Smartphone have been sold that provided an opportunity to businesses to invest in mobile application development and allowed to introduce new business dimensions in market space. As it is easy to change settings and make customizations on Smartphone, therefore there are several programs for Smartphone's from different sellers including Blackberry, Android, iPhone and Microsoft etc. Mobile Application Market is another business sector introduced by Smartphone's. Different mobile operating system vendors have their own mobile application technology hence having a different market for Mobile Applications. Smartphone's also impacted advertising business sector as well. Advertising is an old concept but the features of Smartphone have made it more effective and no doubt, it is an additional positive impact of mobile application for business. Mobile application publisher, distributor and service provider are getting large revenue by providing ads as a part of mobile application.

Usage of other devices (laptops, desktops) for internet access is expected to decrease further online communications, social networking, and consumption of entertainment (video/audio content etc.) services on-the-go drive usage on mobile devices without affecting customer experience. In the near future, demand for wireless broadband services would be higher as compared to fixed broadband services. Demand for fixed broadband services would be majorly limited to urban consumers, who have higher bandwidth/QoS requirements for accessing services like gaming, high definition video streaming etc.

### **OBJECTIVES**

- To analyze the trends in m-commerce.
- To analyze the factors that leads for the growth of m-commerce.

### **SHIFTING DYNAMICS OF THE INDIAN SMARTPHONE MARKET**

The mobile industry's contribution to the country's GDP currently stands at 6.5% (\$140 billion) and is likely to become 8.2% by 2020. India would be leading the smartphone revolution in the coming years, as the largely untapped market slowly gets included into the realms of digital services. In early 2016, India became the second largest smartphone market in the world, trailing China and overtaking the US with about 250 million smartphone users.

India currently has around 300-400 million smartphone users and is expected to lead the smartphone growth reaching 810 million by 2021. The telecommunications market in India is characterized by an urban-rural divide which is manifested by an urban tele density three times higher than that of rural. This explains the high smartphone user concentration in urban cities and an overall low smartphone penetration in the country. The current smartphone penetration in the country stands at as low as ~35%.

Although India continues to be a price sensitive market, there is a growing section of the new-age buyers who are willing to pay a premium for better technology. The access to low cost 4G data services, digital infrastructure, growing middle class and content ecosystem are key contributors to the smartphone market expansion in Indian cities.

Over the years, the choices offered to consumers have sharply increased. In the past, they would walk into a small kirana store and quickly buy what they needed. The number of brands and variants available were limited. If they needed help, advice was available from the owners of these shops; decisions were based on input from a trusted source, and the risk of the consequences of poor decision-making was low. Therefore, the cognitive load of a wrong buying decision was minimal, and consequently, making a choice was simple.

With a rapidly growing economy and free trade, the number of products available has increased rapidly. While consumers have a huge variety to choose from, they also have many more product categories on offer. Earlier, one product served multiple consumer needs, now we have various brands, and within these are numerous variants and pack sizes catering to sub-segments with refined needs.

**Table-1: Trends of Category-Wise Online Shopping 2015: India**

Category	Exclusive Purchase Online (100%)	Most Purchase (61-99%)	About half of Purchase (41-60%)	Some Purchase (1-40%)	Don't Purchase Online
Consumer electronics and computers	6%	16%	10%	43%	16%
Household Appliances	4%	11%	11%	38%	25%
Clothing & Footwear	4%	23%	23%	41%	7%
Books, Music, Movies	6%	21%	17%	42%	7%
Furniture/ Home ware	4%	12%	12%	31%	26%
Sports/ Outdoor Equipment	4%	16%	11%	35%	17%
Jewellery/Watches	4%	15%	12%	33%	22%
Grocery	5%	16%	14%	30%	23%
Toys	5%	19%	11%	37%	13%
Health & Beauty	5%	20%	18%	36%	13%

Sources: PwC Total Retail 2015 Survey

### **GROWING ACCESS TO THE INTERNET AND GREATLY INCREASED USE OF SMARTPHONES**

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### **INTERNET USERS AND THEIR PENETRATION IN INDIA**

**Table-2**

Particulars	2014	2106	2018(E)
Users	226.3 mn	321.8 mn	411.1 mn
Penetration (% of internet users)	18.3%	25.4%	31.7%

Sources: eMarketer, July 2015;

Individuals of any age who use the internet from any location via any device at least once a month

### **SMARTPHONE USERS AND THEIR PENETRATION IN INDIA**

**Table-3**

Particulars	2014	2016	2018(E)
Users	123.3 mn	204.1 mn	279.2 mn
Penetration (% of mobile users)	21.2%	29.8%	36.0%

Sources: eMarketer, July 2015;

Individuals of any age who use the internet from any location via any device at least once a month

### **FREQUENCY OF PURCHASES MADE USING SMART OR MOBILE PHONES IN INDIA IN 2015**

**Table-4**

Particulars	2013 (%)	2015 (%)
Shop Daily	6%	9%
Shop Weekly	12%	24%
Shop Monthly	20%	27%
Shop less Frequent	62%	40%

Sources: PwC Total Retail 2015 survey

### **RETAIL M-COMMERCE SALES IN INDIA**

Companies, which try to be successful in the e-commerce space, should have in mind the specific characteristics of mobile shopping, viz. smaller screens, touch interfaces, limited data volume, etc. in order to target potential customers, who are limited by mobile access. Many e-tailers have realized the potential of mobile commerce in multiplying their sales and are rapidly adopting the necessary tools, with encouraging results.

Customers and companies can choose between various payment options, which use mobile commerce, like stored-value cards, credit cards, premium rate telephone numbers, and charges, added to the customer's phone bill. By selecting the right payment method, different sets of customers can be targeted, including the ones who have no banking accounts. The smartphone will become increasingly important as a digital wallet in the future.

**Table-5: Retail M-Commerce Sales in India (2015-2020) (In US Billion Dollars)**

S. No.	Year	US Billion Dollars
1	2015	7.78
2	2016	15.27
3	2017	26.91
4	2018*	39.56
5	2019*	50.54
6	2020*	63.53

**Sources:** e-marketer (Statista 2017)

The further development of mobile commerce offers great opportunities for e-tailers in India. For some, mobile devices will be the only contact point on their journey towards becoming online customers, while others will use smartphones in addition to computers and laptops. Besides the fact that mobile commerce in India will grow significantly over the next few years, the content available on mobile devices will be personalized to suit individual customers to a greater degree, using information about their previous purchases, social networks, etc. Although screen sizes and data speeds limit the user experience on smartphones, companies will have to continue to find innovative ways to present their products in ways that are competitive for e-commerce stores over personal computers. Moreover, the connection between social networks and mobile commerce will have to be leveraged in order to escalate sales.

### **CONCLUSION**

E-commerce practices have expanded its uses into the quickly evolving mobile phone industry in the form of M-commerce. M-commerce, which stands for mobile commerce, is a key positive development for businesses and organizations. It has increasingly expanded and plays a prominent role in our life.

Smartphone has created new dimensions for business in Indian market. It is not only the smartphone sellers enjoying the business but it also created a new area for mobile application developing companies in India, Internet services provider and other sectors of life to utilize the smartphone to gain competitive advantages. Smartphones have been rapidly transformed from being just handheld telecommunications devices to being a window to the world and are now a means of expressing one's opinion and individuality. It has also become the new retail storefront.

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## **A STUDY ON THE EFFECT OF GST UPON ONLINE CONSUMERS WITH REFERENCE TO SAGAR CITY**

Ankul Pandey<sup>3</sup> Tapan Kaushal<sup>4</sup>

### **ABSTRACT**

*In India the (GST) is one of the major taxation transformations which all set to incorporate State economies and enhancement whole growth. Earlier, industries and businesses pay lot of indirect taxes for example VAT, service tax, sales tax, entertainment tax, octroi and luxury tax. But at present the GST will already implement and all these taxes will conclude to exist. Now there will be only one tax, that too at the national level, monitored by the central government. There are numerous responses, advices and thoughts amongst the public as an outcome of the government's plan was implemented the Goods and Services Tax (GST) from 1<sup>st</sup> July 2017 this year. There was a mammoth uproar against its effectuation. The purpose of this study is to know the impact of GST on online consumers on the Implementation of Goods and Services Tax.*

*The main objective of the GST to create a particular, integrated market that will provide an advantage to the corporate and the economy both simultaneously. India would get a world class tax system and progress tax collections by integration of goods and services taxation. The uniform indirect tax is levied on Goods and Services across a country is known as a Goods and Service Tax (GST). It is a comprehensive tax imposed at each point of value chain from manufacture or sale point to consumption point of goods and services at a national level. When Tax is put only on value addition with input tax credit facility then there is no chance of tax cascading at any stage. It will bring about a qualitative change in the tax system due to GST will reallocate the problem of taxation rightfully between manufacturing and services sectors.*

*The adaptations will be abridged encouraging a common market through the nation. By adopting a GST-Goods and service tax in India which help to the changed indirect tax system. The execution has caused in complex prices for goods and services and consequently this tax may reason problem to publics due to this some of them gave positive opinions and some others gave negative responses. It can show that publics are silent fuzzy and did not know what is GST. Hence, an attempt is made in this present paper to study the concept of goods and service tax and identify the impact of GST on online consumers on the implementation of Goods and Service Tax (GST) in India.*

### **KEYWORDS**

**Online Shopping, GST, Consumer etc.**

### **INTRODUCTION**

Whole scenario of indirect tax system in India is changed by the GST. France is the first country who introduced the GST in 1954. The Unified GST system have been followed by more than 160 countries like Germany, Italy, UK, South Korea etc. But Brazil and Canada like countries have followed the dual GST model. Thus India has been also opted a dual GST system. Under this system, tax is levy and collects by the both central and state government.

The main objectives of the GST is thus to simplify tax complication for the entire economy system. It will be identify in three categories: 1) Central government collect the tax is known as CGST 2) state government collect the tax is known as SGST 3) Relevant on inter-state sales is known as IGST. E-commerce is a platform for selling and purchasing good, tangible or intangible services, facilitation of the same through the use of computer network and telephone services.

E-commerce entities are still worried about how the combo offer will be taxed, what will be taxable amount etc. many times it has been observed that public may face difficulty in understanding the tax system as well as they have different perception on taxes on consumptions. Thus, to know the impact of online consumers buying behaviour before and after the implementation of GST. From the marketing perspective in India it is expected to affect online consumer buying behaviour and spending decision by implementation of GST. We know that price is important factor to affect the consumer buying decisions but taxes are an inevitable part of the buying experiences. It became very difficult to predict that GST is not indirectly influenced the consumer buying decision. The implementation of GST have an important impact on society, economic, political, consumer, marketing etc.

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thus it become an vital topic for discussion in society of India. Indonesia is the first country among all the ASEAN countries to implement the GST in 1984 and other countries followed them. (Berita Harian, 2013). On the other hand, subsequently 1st July 2017, India becomes the last country among ASEAN countries to fully implement GST except Brunei and Myanmar.

### ***JOURNEY OF GST IMPLEMENTATION IN INDIA***

**1994 (Amaresh Baghchi Report):** First announcement of the proposed introduction of GST.

**July 17, 2000 (Ashim Dasgupta):** empowered committee started discussion on **GST**, which introduces VAT System in 2005, which has replaced old age taxation system in India.

**2002-2004 (Vijay Kelkar Task Force):** It implement the Fiscal Responsibility and Budget Management (FRBM) Act, 2003 and powerfully suggested that the integration of indirect taxes into the form of GST in India.

**2006-07:** In this financial year, a proposal was present by the Union Government first time in Union budget speech to introduce GST by April 1, 2010.

**2009 November:** the Empowered Committee of State Finance Ministers (EC) released its First Discussion Paper (FDP) on the GST in November 2009.

**22<sup>nd</sup> March 2011:** The Constitution (115th Amendment) Bill **introduced in Lok Sabha** for levy of GST on all goods or services except for the specified goods. The Bill was lapsed in 2014 and was replaced with the Constitution (122 Amendment) Bill, 2014.

**November 2012:** A “Committee on GST Design”, consisting of the officials of the Government of India, State Governments and Empowered Committee (EC) was constituted.

**2013: August:** Standing Committee submitted its report on GST.

**November:** EC rejected Government proposal to include petroleum products.

**2014: December 18:** Constitution (122nd Amendment) Bill placed in Lok Sabha by Union Finance Minister Arun Jaitley

**2015:** Constitution Amendment Bill passed by Lok Sabha and Bill referred to a 21-member Select Committee of Rajya Sabha headed by Bhupender Yadav and select Committee submits its report.

**2016: August 3:** Bill tabled in Rajya Sabha **and was passed by Rajya Sabha with certain amendments.**

**2017: Four GST related Bills become Act following Presidents assent & passage in Parliament:**

- Central GST Bill
- Integrated GST Bill
- Union Territory GST Bill
- GST (Compensation to States) Bill
- **GST Council finalizing the GST Rules and GST Rates**

**GST Bill From 1st July 2017 is implemented.**

### **GST is Levied**

GST is levied on the place of consumption of goods and services. It can be levied on following states:

- Intra-state supply and consumption of goods and services.
- Inter-state movement of goods.
- Import of goods and services.

### **LITERATURE REVIEW**

According to Jangra (2017) studied, “impact of goods & services tax (GST) on economic development” is more focused on advantages of GST and Challenges faced by Indian Context. It conclude that all sectors of economic viz. medium, small scale units, intermediaries, importers, exporters, traders, professional and consumers even though the industry business including govt. department & service sector shall have to bear impact of GST.

Joseph (2015) in his research study stated that abolition of other central and state taxes is the excessive benefit of the GST tax system. GST, the taxation liability will be distributed equitably between manufacturing and services, through a lowertax rate by increasing the tax base and minimizing exemptions. It helps numerous areas in the economy in the nation will get profited through the implementation of GST countrywide.

Kaushal (2017) have mentioned that GST is not in a forthright manner is profitable to enhancement the growth, through there are numerous problems in the starting but GST is help to take the E-Commerce market to a new height in future. Overall GST is the major tax reform till date in the country and it's going to create a single tax rate market and help the sellers. At the starting, its bit tough to understand but it will lead to be a smooth tax system in future.

### **OBJECTIVES OF STUDY**

To identify the awareness and knowledge of online Consumers towards issues of GST.

To know the impact of GST on Online Consumers Purchase intentions before and after the implementation.

### **SCOPE OF STUDY**

The current study provides advantages for organizations, businesses and websites mend their marketing strategies. It helpful for problem acknowledgement, awareness and knowledge about the online Consumers towards issues of GST. It designed an idea for social marketing across to consumers rather than selling something. This present study is restricted to the online consumers of Sagar City. Further scope of the study is inadequate to ascertain the impact of GST on Online Consumers & there purchase intention.

### **LIMITATIONS OF STUDY**

The sample was selected from few consumers of Sagar city which is may not represent the entire population of India

The sample was limited to 100 respondents.

The range limited only age group- 15 to 65 years.

Randomly selected respondents had been used for filling the questionnaire. 5. The study is confined only to know impact, knowledge and awareness of GST by online Consumers.

The outcome of the study is restricted to the customers who buy products online.

### **NEED OF THE STUDY**

The study is very much pertinent to current eras as this will make the awareness towards the impact of GST on the online purchasers and there purchase intention. One of broadest economic reforms is commenced in form of GST. It has an impact on all the three sectors and also their subsectors. Electronic commerce is one of the vital parts of Tertiary sector or service sector. Thus, it knows the impact of GST on the online consumers and their purchases intention.

### **PROBLEM STATEMENT**

GST is one of the important steps towards reforms in tax system in India as a country. It adopt a simpler, better, and more effective tax structure so as to pave technique for more comprehensive, transparent, business-friendly and efficient tax structure. It is further well-thought-out the world's best tax system based on the execution of the country which has implemented the GST. In India, GST has just being executed.

The government and its team are still in their manner to string out the information of GST with the aim of conflict misperception among general public. Sales and agreements are made practically day by day and certain of these dealings essential individuals to pay the GST. It is an issue if individuals are quiet unacquainted or blur with the tax system of GST and turn out to be most horrible when publics disregard and prohibit not paying the tax.

The study is concentrating on the awareness and knowledge of online Consumers towards issues of GST. GST is a widespread subject-matter that is being debated by persons every day, it is compulsory to identify whether the consumers are cognizant of the government's strategy and ensure they have knowledge on this issue.

### **RESEARCH METHODOLOGY**

**Selection of Samples:** The sample selected on purposive random basis.

**Universe:** Online Consumers of Sagar city

**Sample Size:** The qualitative and quantitative methodology both are used to determine the sample size. The sample size of the study was 75 respondents in different areas of Sagar city, which is located in the Madhya Pradesh. The questionnaire was distributed among 100 respondents but we received only 75 valid responses.

**Sampling Procedure / Method:** Convenience Sampling method was selected for the present study.

**Sample Technique:** a) Percentage analysis b) Tabulation

### *Collection of Data*

Questionnaire method used for collection of data .A small survey was done to get an idea of the various problems. In the small survey the same procedure was followed as was to be adopted in actual survey.

### *Sources of Information*

- a) **Primary Sources:** Consumers from age group 15 to 65 years were selected as the primary sources through questionnaire.
- b) **Secondary Sources:** The information was gathered from Published article, different books, magazines, journals, news scripts and websites etc.

### **Scale Used**

For finding the awareness, knowledge and impact of GST on Online Consumers & there Purchase intentions:

- 1. Strongly Agree, 2. Agree, 3. Neutral, 4. Disagree, 5. Strongly Disagree
- 1. Always, 2. Most of Time, 3. Cannot Say, 4. Sometime, 5. Never

**Table-1**

Statement	Always	Most of Time	Cannot Say	Sometime	Never	Total
You purchase from online shopping	16(21.33%)	22(29.33%)	10(13.33%)	14(18.67%)	13(17.33%)	75(100%)
Do you think online shopping is a solution to your daily needs?	34(45%)	15(20%)	8(10.67%)	18(24%)	0	75(100%)
Do you recommend their friends and family members for online shopping	15(20%)	35(47%)	8(10.67%)	16(21.33%)	1(1%)	75(100%)
Do you think the online shopping is convenient and easy as compare to shopping in the market	18(24%)	11(14.67%)	12(16%)	22(29.33%)	12(16%)	75(100%)

**Sources:** Authors Compilation

### *Analysis of Data*

After the data was collected it was tabularized and analysed statistically. The information gathered was from the 75 respondents surveyed from Sagar city. The age of the respondents is 15 to 60 years.

According to this table we know that the percentage of consumers, which are preferred the online shopping.

Here we an analysis the consumers of Sagar city who favoured the adoption of online shopping before and after the implementation of GST period. 21.33% are regular consumer of online shopping like a Fashion as its fetters for them and 17.33% customers do not favoured the espousal for online shopping due to certain grounds such as lack of internet knowledge, don't interested to take Risk, inadequate resources etc. 34(45%) respondents are always think that online shopping is a solution to fulfil our daily needs of the people. 35(47%) respondents most of time believe that online shopping is secured , convenience and time saving approach so that it recommend their friends and family members for online shopping. There is mix reaction is found to the respondents around 22(29.33%) think the online shopping is sometime convenient and easy as compare to shopping in the market but sometime it become a complicated process at the time of refund the product due to some issues.



**Table-2**

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total Score
Are you aware of GST? Yes No	69(92%) 6(8%)					75(100%)
GST objectives to make the tax system more efficient, wide-ranging and apparent	9(12%)	44(59%)	3(4%)	13(17%)	6(8%)	75(100%)
GST will generate and increase revenue for the country.	11(15%)	51(68%)	7(9%)	3(4%)	3(4%)	75(100%)
GST can overcome the Sale and Services Tax which was introduced earlier	23(30%)	15(20%)	17(23%)	14(19%)	6(8%)	75(100%)
GST will not burden people	8(11%)	6(8%)	5(7%)	51(68%)	5(7%)	75(100%)
Do not understand how GST would be implemented	53(71%)	9(12%)	5(7%)	4(5%)	4(5%)	75(100%)
GST is the best tax system adopted by many countries around the world.	11(15%)	39(52%)	13(17%)	9(12%)	3(4%)	75(100%)
Increase in tax rates of products after implementation of GST	6(8%)	45(60%)	7(9%)	8(11%)	9(12%)	75(100%)
Impact of prices after implementation of GST	31(41%)	20(27%)	11(15%)	9(12%)	4(5%)	75(100%)
After implementation of GST the reduction of discounts of product	45(60%)	19(25%)	3(4%)	4(5%)	4(5%)	75(100%)
After implementation of GST the return of product is difficult	39(52%)	15(20%)	7(9%)	8(11%)	6(8%)	75(100%)
Quicker delivery of online product after implementation of GST	61(81%)	3(4%)	5(7%)	4(5%)	2(3%)	75(100%)
Cancellation of purchased an online product is difficult after implementation of GST	65(86%)	6(8%)	2(3%)	2(3%)	-	75(100%)
Relatively price is higher of the products after implementation of GST	16(21%)	19(25%)	6(8%)	27(36%)	7(10%)	75(100%)
There is no change in your buying behaviour decision before and after the implementation of GST.	35(47%)	21(28%)	7(9%)	9(12%)	3(4%)	75(100%)
Do you continue online shopping after the implementation of GST? Yes No	67(89%) 8(11%)					75(100%)

**Sources:** Authors Compilation

## FINDINGS

The objective of the research study to identify the awareness and knowledge of online Consumers towards issues of GST. And also to know the impact of GST on Online Consumers Purchase intentions before and after the implementation. The findings divulge from the given table:

The heard the name or aware of GST only 92% of the respondents and 8% of the respondents are not aware the GST.

44 (59%) of the respondents are agree that the GST has main objectives to make the tax system more efficient, wide-ranging and apparent but on other hand 13(17%) of the respondents are disagree with the statement.

51(68%) of the respondents agree that GST will generate and increase revenue for the country. While 7% show their uncertainty with the statement. This displays that the respondent recognize that the tax is foremost source of income for the any nations.

Here, only 23(30%) of the respondents strongly agree that GST can overcome the Sale and Services Tax which was introduced earlier. 17(23%) neutral opinion, 15(20%) agree, and 14(19%) disagree with this statement by the respondents. This find that the mix reaction of people toward the statement due to most of the respondents do not aware the tax system which is followed by them.

51(68%) of the respondents are disagree that the GST will not burden people. It means most of the respondents think that it will burden on the people and it may affect the people.

53(71%) of the respondents are strongly agree that they do not really understand how GST would be implemented.

39(52%) of the respondents are agree that the GST is the best tax system adopted by many countries around the world although they do not understand that how it is work but they thought that they relief from this complex tax system which is followed by them earlier.

45(60%) of the respondents are agree that the tax rates of products is increase after implementation of GST.

Impact of prices after implementation of GST with this statement 31(41%) are strongly agree and 20(27%) are agree by the respondents

Reduction of discounts of the product after implementation of GST with this statement is 45(60%) and 19(25%) of the respondents are strongly agree and agree.

After implementation of GST, 39(52%) of the respondents strongly agree that the return of product brought online is difficult.

61(81%) of the respondents are strongly agree that after implementation of GST the delivery of the online product is become speedier and easiest.

Cancellation of purchased an online product is difficult after implementation of GST is strongly agree/ followed by 65(86%) of the respondents.

27(36%) of respondents disagree that the relatively price is higher of the products after implementation of GST. This is followed by agreed and strongly agreed by 19(25%) and 16(21%).

There is no change in buying behaviour decision before and after the implementation of GST, this statement is followed by the 35(47%) and 21(28%) strongly agreed and agreed of the respondents.

67(89%) of the respondents are still continuing online shopping after the implementation of GST.

## CONCLUSION

Purchasing decision of online consumer is affected by implementation of GST. In India GST will be already replace the present regime of the tax system which would be follow by the Indian society The present study is found that publics are aware about the tax and they also know that they pay on buying of commodities in indirect form, but they are not interested to know tax on their buying of commodities due to not giving so much importance the tax. Thus they know proper billing help to identify and decide the liability of tax compliance.

After the implementation of GST, first four month consumer are less interested to buying the commodities. This happen due to they have already purchased more shopping product before the implementation of GST then automatically few months sales of product is decline. However, retailer should implemented more innovative marketing strategies to increase the sales of product through advertisements and sales promotion tactics like coupons, rebates, price packs, discounts etc. GST regime awareness programme focussing make the tax system comprehensive and revenue generating by staged collection of tax.

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## **IMPACT OF SOURCES OF INFORMATION ON CONSUMER BUYING BEHAVIOUR WITH REFERENCE TO PREMIUM CARS IN HYDERABAD CITY**

Mohammed Babar Zamaan<sup>5</sup> Dr. P. Devaraju<sup>6</sup>

### **ABSTRACT**

*Marketing pivot on understanding and creating a customer. What consumer would buy it – is no easy task. This would be evident from the fact that though several marketing scholars have spent enormous time and effort on this subject and analysed it from different angles and under different premises, there is no unified, tested and universally established theory of buyer behaviour. What we have is only collection of ideas that have taken from economics, psychology and sociology. There are several factors contributing to the consumer behaviour, one among them is sources of information, which include different variables.*

*The present study examines the influence of sources of information on consumer buying behaviour towards premium cars in Hyderabad City. Anova test was used to test the hypotheses of this study. Findings of the research show that different variables of information influence buying behaviour. The findings indicate that most of the variables influence the consumer buying behaviour towards premium cars and few do not.*

### **KEYWORDS**

**Consumer, Behaviour, Information, Variable, Anova etc.**

### **INTRODUCTION**

Indian automobile industry has grown leaps and bounds since 1898, a time when a car had touched the Indian streets for the first time. At present, it holds a promising tenth position in the entire world with being # 2 in two wheelers and # 4 in commercial vehicles. Withstanding a growth rate of 18% per annum and an annual production of more than 2 million units, it may not be an exaggeration to say that this industry in the coming years will soon touch a figure of 10 million units per year. Automobile industry is one of the fastest growing industries of the world. With more than 2 million new automobiles rolling out each year, on roads of India, the industry is set to grow further. Automobile industry made its silent entry in India in the nineteenth century. Since the launch of the first car in 1897, India automobile industry has come a long way.

The automobile industry in India is world's third largest, with the country currently being the world's seventh largest commercial vehicle manufacturer. Two-wheelers dominate the industry and had a 79 per cent share in the automobile production in FY17. Two-wheeler sales are expected to grow 8-10 per cent in FY18. Indian automobile industry has received foreign direct investments (FDI) worth US\$ 17.39 billion between April 2000 and June 2017.

The central focus of marketing is consumer. In order to develop successful marketing plans, it is necessary to examine target market characteristics and needs life-style and purchase processes and structure, product distribution, promotion and price decision accordingly. Consumer means "One who or that which consumes; one who uses a commodity or service". Behaviour means, "manner of behaving or acting; the action or reaction of any material under given circumstances". Consumer Behaviour is simply a subsection of the longer field of human behaviour. "Human behaviour refers to the total process by which individuals interact with the environment". Engle, Blackwell and Kollat have defined consumer behaviour as "The act of individuals directly involved in obtaining and using economic goods and services, including the decision process, that precede and determined these acts". Schiffman and Kanuk stated that "consumer behaviour is the behaviour that consumer display in searching for, purchasing, using, and evaluating product and services and ideas which that they expect will satisfy their needs."

Consumer behaviour is influenced by the individuals, socio cultural factors namely the culture, subculture, religion, social class and family life-cycle, personal factors namely the culture, subculture, religion, social class and family life-cycle, personal factors namely age, sex, marital status, education, occupation, income and psychological factors namely the motivation, perception, learning, personality, attitude, lifestyles. These factors highly influence the individuals in arriving at making decisions regarding the products and services.

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## **OBJECTIVES OF STUDY**

### **Primary Objective**

To evaluate the factors influencing consumer buying behaviour towards premium cars in Hyderabad City.

### **Secondary Objective**

To evaluate the role of Sources of Information influencing consumer buying behaviour towards premium cars in Hyderabad City.

### **Hypothesis**

#### **Primary Hypothesis**

H<sub>0</sub>: Consumer buying behaviour towards premium cars is not influenced by varied factors in Hyderabad City.

H<sub>1</sub>: Consumer buying behaviour towards premium cars is influenced by varied factors in Hyderabad City.

#### **Secondary Hypothesis**

H<sub>0</sub>: Sources of Information negatively influence consumer buying behaviour towards premium cars in Hyderabad City between different age groups.

H<sub>1</sub>: Sources of Information positively influence consumer buying behaviour towards premium cars in Hyderabad City between different age groups

### **Sampling Design**

#### **Sampling Plan**

The sample plan consists of premium car users in the geographical region Hyderabad of Telangana state. Further, the total size and composition of customers of different demographical areas form the base for prescribing no. and size of respondents.

#### **Sample Size**

It is a proportional representation of the customer density at a given location, gender levels. These form the base for fixing the sample size of 450 for Hyderabad city of Telangana state.

#### **Sampling Technique**

The process of drawing sample respondents from the sample universe is known as sampling technique, among many techniques available Stratified sampling is employed for the purpose since it is more appropriate as the sample respondents are distributed in different places as stratified groups at different hierarchical levels of the firms.

#### **Sample Unit**

Sample unit defines the single unit of the sample, in the pre-decided sample, which is to be drawn from the selected geographical region, a respondent who finds a place will be a male, or female, in the age group 30 to > 60 yrs., with any occupational title, and with the income level presupposed.

### **Data Collection**

The data collected for the present study comprises of both primary and secondary sources.

#### **Primary Data**

Data Collected from respondents through questionnaire. The respondents were interviewed and asked to fill the questionnaire. The first part deals with their behavior towards luxury cars and factors influencing in making decisions. The second part of the questionnaire contains the questions concern to the respondents profile in terms of their age, sex, occupation, educational background and income.

## Secondary Data

In order to fulfil the objectives of the study, secondary data were collected. The secondary data pertaining to Hyderabad city were collected from various government publications and records the major source of secondary data being Census of India 2001, 2011 (provisional results), District Statistical Centre and Collectorate. The secondary data has been collected from various magazines, journals, daily newspapers, survey reports and reference books etc.

## Statistical Design

### Data Analysis

The data was analyzed giving thought to the main hypothesis to find relationships between, different motivational factors. Each assessment was looked at individually and descriptive statistics were computed for each. Frequency reports on the specific questions were run to determine agreement within the measures. All assessments were also correlated with one another to find existence of any relationships between the variables. The scale used in the Questionnaire was from 1 to 5, 5 being the very high score and 1 being the very low for each question.

### Statistical Tools Applied

The following tests were performed to explore different relationships: ANOVA.

## DATA ANALYSIS AND INTERPRETATIONS

### Sources of Information and Age Group

**Table-1: ANOVA on Sources of Information Influence Consumer Buying Behaviour between Age Groups**

Sources of Information	Age	Sum of Squares	D.f.	Mean Square	F	Sig.
T.V. Advertisements	Between Groups	1.421	3	.449	5.012	.003
Newspapers	Between Groups	.989	3	.346	3.819	.025
Magazines	Between Groups	.121	3	.038	.398	.034
Friends	Between Groups	.507	3	.187	1.843	.021
Family members	Between Groups	.185	3	.054	1.081	.002
Internet / E-mails	Between Groups	.212	3	.058	1.821	.028
Websites	Between Groups	.854	3	.202	3.287	.031
Radio	Between Groups	.579	3	.247	.589	.112
Brochures / Printed Displays	Between Groups	.874	3	.341	.658	.224
Wall Writing / Bill Board	Between Groups	.743	3	.479	1.209	.355
Demos / Test Rides	Between Groups	.891	3	.540	1.854	.014
Road Shows	Between Groups	.698	3	.872	1.248	.010
Showroom Visit	Between Groups	.981	3	.741	2.354	.001
Expert Opinions	Between Groups	.549	3	.951	1.254	.003
Sales Person	Between Groups	.628	3	.843	1.298	.004

**Sources:** Calculations from Sources of information data through SPSS

From table 1, it has been observed that the 'f' value and 'p' value at 3 degrees of freedom for T V advertisements is 5.012 and 0.003, Newspaper is 3.819 and 0.025, Magazines is 0.398 and 0.034, Friends is 1.843 and 0.021, Family members is 1.081 and 0.028, Internet / E-mails is 1.821 and 0.028 and for Websites is 3.287 and 0.031 respectively at 5% level of significance. Here the computed 'p' value of the above variables is less than the acceptable statistical significance (0.05). Hence, the null hypothesis is rejected and alternate hypothesis is accepted. This signifies that above specified variables influences consumer buying behaviour towards premium cars in Hyderabad City among the different age groups.

Further, it is observed from the above table that the 'f' value and 'p' value at 3 degrees of freedom for Radio is 0.589 and 0.112, Brochures / Printed Displays is 0.658 and 0.224 and for Wall Writing / Bill Board is 1.209 and 0.355 respectively at 5% level of significance. Here the computed 'p' value of the above variables is greater than the statistical significance (0.05). Hence, the null hypothesis is accepted and alternate hypothesis is rejected. This signifies that above specified variables *negatively* influences consumer buying behaviour towards premium cars in Hyderabad City among the different age groups.

### Sources of Information and Gender

H<sub>0</sub>: Sources of Information negatively influence consumer buying behaviour towards premium cars in Hyderabad City between Gender groups.

H<sub>1</sub>: Sources of Information positively influence consumer buying behaviour towards premium cars in Hyderabad City between Gender groups.

**Table-2: ANOVA on Sources of Information Influence Consumer Buying Behaviour towards Premium Cars in Hyderabad City between Gender Groups**

Sources of Information	Gender	Sum of Squares	d.f.	Mean Square	F	Sig.
T.V. Advertisements	Between Groups	.076	1	.076	.829	.025
Newspapers	Between Groups	.368	1	.368	3.127	.049
Magazines	Between Groups	.014	1	.014	.049	.035
Friends	Between Groups	.018	1	.018	.096	.047
Family Members	Between Groups	.062	1	.062	.876	.045
Internet / E-mails	Between Groups	.053	1	.053	1.235	.031
Websites	Between Groups	.121	1	.121	1.781	.023
Radio	Between Groups	.233	1	.233	.841	.510
Brochures / Printed Displays	Between Groups	.354	1	.354	.871	.641
Wall Writing / Bill Board	Between Groups	.952	1	.952	.659	.548
Demos/Test rides	Between Groups	1.359	1	1.359	.977	.652
Road Shows	Between Groups	.587	1	.587	.892	.611
Showroom Visit	Between Groups	.689	1	.689	.414	.029
Expert Opinions	Between Groups	.982	1	.982	.522	.023
Sales Person	Between Groups	1.025	1	1.025	.855	.041

**Sources:** Calculations from Sources of Information data through SPSS

From table 2, it has been observed that the calculated 'p' value for T V advertisements, Newspaper, Magazines, Friends, Family members, Internet / E-mails and for Websites is less than the table value 0.05. Hence, the null hypothesis is rejected and alternate hypothesis is accepted. This signifies that above specified variables influences consumer buying behaviour towards premium cars in Hyderabad City among gender groups.

Further, it is observed from the above table that the 'p' value for Radio, Brochures/Printed Displays, Wall Writing / Bill Board, Demos / Test rides and road shows is more than the statistical significance (0.05). Hence, the null hypothesis is accepted and alternate hypothesis is rejected. This signifies that above specified variables *negatively* influences consumer buying behaviour towards premium cars in Hyderabad City among the different gender groups.

### Sources of Information and Education

H<sub>0</sub>: Sources of Information negatively influence consumer buying behaviour towards premium cars in Hyderabad City between Education groups.

H<sub>1</sub>: Sources of Information positively influence consumer buying behaviour towards premium cars in Hyderabad City between Educations groups.

**Table-3: ANOVA on Sources of Information Influence Consumer Buying Behaviour towards Premium Cars in Hyderabad City between Education Groups**

Sources of Information	Education	Sum of Squares	d.f.	Mean Square	F	Sig.
T.V. Advertisements	Between Groups	.426	2	.524	1.248	.028
Newspapers	Between Groups	.098	2	.042	.589	.049
Magazines	Between Groups	.012	2	.006	.658	.021
Friends	Between Groups	.142	2	.071	.584	.289
Family Members	Between Groups	.106	2	.053	1.191	.032
Internet / E-mails	Between Groups	.007	2	.004	.107	.036
Websites	Between Groups	.394	2	.197	3.359	.041
Radio	Between Groups	.387	2	.174	2.358	.251
Brochures / Printed Displays	Between Groups	.954	2	.547	2.145	.275

Wall Writing / Bill Board	Between Groups	.487	2	.149	1.471	.217
Demos/Test rides	Between Groups	.982	2	.479	2.587	.017
Road Shows	Between Groups	.457	2	.874	.981	.025
Showroom Visit	Between Groups	.258	2	.357	.847	.003
Expert Opinions	Between Groups	.541	2	.008	.921	.035
Sales Person	Between Groups	.513	2	.047	.657	.023

**Sources:** Calculations from Sources of Information data through SPSS

From table 3, it has been observed that the calculated 'p' value for T V advertisements, Newspaper, Magazines, Friends, Family members, Internet / E-mails is and for Websites is less than the table value 0.05. Hence, the null hypothesis is rejected and alternate hypothesis is accepted. This signifies that above specified variables influences consumer buying behaviour towards premium cars in Hyderabad City among education groups.

Further, it is observed from the above table that the 'p' value for Radio, Brochures / Printed Displays, Wall Writing / Bill Board, Demos / Test rides and road shows is more than the statistical significance (0.05). Hence, the null hypothesis is accepted and alternate hypothesis is rejected. This signifies that above specified variables *negatively* influences consumer buying behaviour towards premium cars in Hyderabad City among the different education groups.

#### **Sources of Information and Occupation**

H<sub>0</sub>: Sources of Information negatively influence consumer buying behaviour towards premium cars in Hyderabad City between Occupation groups.

H<sub>1</sub>: Sources of Information positively influence consumer buying behaviour towards premium cars in Hyderabad City between Occupation groups.

**Table-4: ANOVA on Sources of Information Influence Consumer Buying Behaviour towards Premium Cars in Hyderabad City between Occupation Groups**

Sources of Information	Occupation	Sum of Squares	d.f.	Mean Square	F	Sig.
T.V. Advertisements	Between Groups	.214	4	.053	.586	.028
Newspapers	Between Groups	.548	4	.251	.658	.021
Magazines	Between Groups	.491	4	.123	1.448	.017
Friends	Between Groups	.681	4	.514	1.982	.039
Family Members	Between Groups	.610	4	.358	2.601	.031
Internet / E-mails	Between Groups	.146	4	.036	1.074	.036
Websites	Between Groups	.304	4	.076	1.282	.027
Radio	Between Groups	.394	4	.157	2.011	.309
Brochures / Printed Displays	Between Groups	.622	4	.620	.998	.312
Wall Writing / Bill Board	Between Groups	.246	4	.061	.661	.620
Demos/Test rides	Between Groups	.952	4	.079	.512	.033
Road Shows	Between Groups	.863	4	.216	1.796	.012
Showroom Visit	Between Groups	.283	4	.071	1.588	.017
Expert Opinions	Between Groups	.584	4	.078	1.002	.004
Sales Person	Between Groups	.852	4	.159	1.204	.009

**Sources:** Calculations from Sources of Information data through SPSS

From table 4, it has been observed that the calculated 'p' value for T V advertisements, Newspaper, Magazines, Friends, Family members, Internet / E-mails and for Websites is less than the table value 0.05. Hence, the null hypothesis is rejected and alternate hypothesis is accepted. This signifies that above specified variables influences consumer buying behaviour towards premium cars in Hyderabad City among occupation groups.

Further, it is observed from the above table that the 'p' value for Radio, Brochures / Printed Displays, Wall Writing / Bill Board, Demos / Test rides and road shows is more than the statistical significance (0.05). Hence, the null hypothesis is accepted and alternate hypothesis is rejected. This signifies that above specified variables *negatively* influences consumer buying behaviour towards premium cars in Hyderabad City among the different occupation groups.

### Sources of Information and Income

H<sub>0</sub>: Sources of Information negatively influence consumer buying behaviour towards premium cars in Hyderabad City between income groups.

H<sub>1</sub>: Sources of Information positively influence consumer buying behaviour towards premium cars in Hyderabad City between income groups.

**Table-5: ANOVA on Sources of Information Influence Consumer Buying Behaviour towards Premium Cars in Hyderabad City between Income Groups**

Sources of Information	Income	Sum of Squares	d.f.	Mean Square	F	Sig.
T.V. Advertisements	Between Groups	.978	4	.245	2.738	.028
Newspapers	Between Groups	.851	4	.289	1.998	.014
Magazines	Between Groups	.547	4	.652	1.478	.025
Friends	Between Groups	.628	4	.458	.992	.036
Family Members	Between Groups	.534	4	.133	3.038	.017
Internet / E-mails	Between Groups	.040	4	.010	.292	.047
Websites	Between Groups	.217	4	.054	.912	.045
Radio	Between Groups	.419	4	.105	1.133	.340
Brochures / Printed Displays	Between Groups	.322	4	.081	.947	.437
Wall Writing / Bill Board	Between Groups	.720	4	.180	1.493	.203
Demos/Test rides	Between Groups	.258	4	.189	1.022	.036
Road Shows	Between Groups	.854	4	.851	1.078	.041
Showroom Visit	Between Groups	.541	4	.752	.582	.040
Expert Opinions	Between Groups	.620	4	.024	.323	.004
Sales Person	Between Groups	.563	4	.011	.524	.001

**Sources:** Calculations from Sources of Information data through SPSS

From table 5, it has been observed that the calculated 'p' value for T V advertisements, Newspaper, Magazines, Friends, Family members, Internet / E-mails and for Websites is less than the table value 0.05. Hence, the null hypothesis is rejected and alternate hypothesis is accepted. This signifies that above specified variables influences consumer buying behaviour towards premium cars in Hyderabad City among income groups.

Further, it is observed from the above table that the 'p' value for Radio, Brochures / Printed Displays, Wall Writing/Bill Board, Demos / Test rides and road shows is more than the statistical significance (0.05). Hence, the null hypothesis is accepted and alternate hypothesis is rejected. This signifies that above specified variables *negatively* influences consumer buying behaviour towards premium cars in Hyderabad City among the different income groups.

### FINDINGS

It is found that T V advertisements, Newspaper, Magazines, Friends, Family members, Internet / E-mails and for Websites influences consumer buying behaviour towards premium cars in Hyderabad City among occupation groups.

Variables like Radio, Brochures / Printed Displays, Wall Writing / Bill Board, negatively influences consumer-buying behaviour towards premium cars in Hyderabad City among the different occupation groups.

### SUGGESTIONS

It is suggested that manufacturers should focus on increasing the effectiveness of other sources of information, which have low influence on consumers buying behaviour.

### CONCLUSIONS

It is concluded that sources of information have wider influence on the buying behaviour of the consumers towards premium cars in Hyderabad city, which need to be sustained by the manufacturers.

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## **AD-HOC ON DEMAND DISTANCE VECTOR: STUDY OF EVALUATION OF PERFORMANCE ON WSN**

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### **ABSTRACT**

*To monitor physical environment in various application like military, agriculture, medical transport, industry etc., the deployment of sensor networks are growing either manually or randomly. The main aspect of monitoring the physical environment is the inspection of critical situations in the case of wireless sensor network. The sensing of relative information at the time of emergency plays the major role in monitoring application and sensing the relative information comes under critical condition. There are various features of sensor networks that needed to be met those features termed as fast, reliable and fault tolerant. To meet these features is the big challenge in the wireless environment. There must be a system that should work fast enough in the time of explosions, fire and leaking of toxic gases. In the study researcher have focused on the working on routing protocol by using various factors such as Packet Delivery Fraction (PDF), Throughput, Normalized routing load Parameters etc. The major point of research is to discuss and evaluate the performance of the AODV routing protocol and later on to modify them.*

### **KEYWORDS**

**AODV, PDF, Throughput, Normalized Routing Load etc.**

### **INTRODUCTION**

A type of mobile ad-hoc networking protocol is known as Ad-Hoc On-demand Distance Vector (AODV) routing protocol. In present a field of research among the community of network is Wireless ad-hoc routing protocols such as AODV. Therefore, simulation tools for these kinds of protocols are very much important. In this research researcher have studies and implemented existing protocol and after the study and implementation of existing protocol, researchers are required to design the new AODV protocol that gives much better result in comparison to existing AODV protocol. Various parameters are used for simulation purpose these parameters are:

Packet Delivery Fraction (PDF),  
 Throughput,  
 Normalized routing Load Parameters,  
 Energy.

The AODV router is contains a state machine. The state machine processes incoming requests from the scalable wireless area networks. When it is required to transmit the message from one node to another node then the task of the network is to do the transmission and for the transmission of messages from one node to another the network call upon AODV to find the next-hop. As soon as the AODV router gets a request to transmit message, it inspect its routing table to observe the existence of route. Every routing table entry has following fields:

Destination address,  
 Next hop address,  
 Destination sequence number,  
 Hop count.

The router routinely forwards the message to the next node or next hop if there is the existence of route. In another case, the message, which is transmitted, is saved in a message queue and then a route request is initiated to search out a route [1].

### **AODV ROUTE DISCOVERY**

For the purpose to find the route of a message from source to destination network flooding is required by using a Route Request (RREQ) message. The initial step is the origination of node, which broadcasts a RREQ message to its nearest nodes, the receiver

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node gets the message and again broadcast the forwarded RREQ message to its neighbor and this process continues until the destination neighbor founds. While transmitting the RREQ message it must be ensured that a cycle should not be created during the transmission of the message from source to destination. To prevent the creation of cycle each node must have a technique to maintain a route request buffer, which contains the path of a node. Since these requests broadcast via the network, middle nodes store reverse paths to the beginning node. As the mediator node can have number of reverse routes but the selection of the middle node for routing the packet is based on the smallest hop count. A node getting the request either recognizes of a “fresh enough” route from source to the destination, or is itself the destination. The destination node causes a Route Reply (RREP) message, and transmits the message with the reverse path towards the source node. As soon as the passes of the RREP message via mediator nodes there is the need to update in routing tables, and making change in routing table will assist in the future because messages can be routed via concerned nodes to the destination end. The possibility for the RREQ originator is to get a RREP message from one or more mediator node. Therefore, as the result, the RREQ originator will change its routing table with the freshest routing information. It means that the routing table will maintain the route with the greatest destination sequence number. By the assistance of node, the RREQ messages are stored in some storing device known as buffer and the receiver node ultimately generates a RREP message. The main concern of having a buffer that might contains replicated RREQs arrived from various routes but the receiver node does not respond with multiple RREPs. In another situation is that if the node gets a RREQ with a better route (i.e. number of hop counts is smaller) then a new RREP will be sent. The buffer also contains the entry of each RREQ with a couple of values:

The identification numbers (RREQ id) of route request.  
The node address that initiated the request.

Therefore, the pair distinctively notifies a request or demand across the entire nodes within the network. In the case of preventing, the growing size of buffers indefinitely there must be the termination of entry within a certain amount of time and then is removed. In addition, each node's buffer contains its maximum limit or size and after reaching to the maximum limit of node the oldest entries will be swapped out to make space for another node[2][3] .

## **PERFORMANCE RESULTS**

At the time of simulation of AODV, it is to determine that how well it scales and this is the main aim of AODV protocol. The performance of protocol varies with different number of nodes in the network. There are various scenarios to understand the different parameters of AODV protocol under the existing condition, these parameters are as follows:

The scenario is to experience the number of Packet send and receive at the same time Packet Delivery Ratio (PDR) is calculated.

The scenario is to experience the Throughput.

The scenario is to experience the energy efficiency.

The scenario is to experience the Normalize Routing Load [4][5]

Researcher has conducted various experiments to show the performance of these parameters. The conditions and specific values for implementation of AODV protocol are shown in the table below (table-1).

**Table-1: Values for Implementation of AODV Protocol**

<b>Types</b>	<b>Values</b>
Channel	Channel/Wireless Channel
Radio Propagation Mode	Propagation/TwoRaygroud
Network Interface	Physical/WirlessPhy
MAC	Mac/802 11
Interface Queue	Queue/DropTail/PriQueue
Antenna	Antenna/Omni antenna
Dimension of Topology (m)	800*800
Number of simulated node	100
Simulated Routing Protocol	AODV
Simulation Time	Depending
Traffic Source	CBR/FTP
Pause Time	2 sec
Packet Size	512
Performance Evaluation Metrics	PDR, Throughput, Energy, Avg End to End Delay, NRL

**Sources:** Authors Compilation

### **PROPOSED MODEL FOR AODV USING LEACH (HIERARCHICAL MODEL)**

The research starts with the tcl script for AODV using LEACH protocol. Researchers have used various parameters to execute the AODV algorithm. Researchers have start their research with 100 nodes, simulation time 15ns, network size 800\*800, traffic size of Constant Bit Rate and packet size is of 512 byte. The simulation starts with the simulator NS 2.35 having wireless channel with random waypoint. The AODV protocol also uses TCP protocol having MAC 802.11 type.

The selection of Cluster Head is come with a formula that is:

$$(\text{expr int } (\$val \text{ (nn)/10}))$$

While the selection of Master Cluster Head is calculated by:

$$(\text{expr int } (\$val \text{ (n\_ch)*1/10}))$$

The total energy occupied by the node is 1000 Joule for the transmission of packets from source to destination under the AODV protocol.

### **PROBLEM FORMULATION FOR PROPOSED MODEL**

The following work has been done to fulfill the objective of research work as:

Proposed a new energy enhancement technique based on energy efficient mechanism.

Applying proposed technique on LEACH and AODV routing protocol, which enhances energy of nodes in ad-hoc network environment.

Performance is estimated on base of various QOS parameters such as end-to-end delay, packet delivery ratio (PDR), throughput, and energy.

Result is analyzed by comparing of proposed method on AODV and existing reactive routing protocol AODV with above-mentioned QOS parameters.

Simulation work is done on NS - 2.35 simulators (ns-allinone-2.35) using Ubuntu 14.04 LTS as operating system and find out comparative results which enhance efficient energy in network [6][7][8].

### **Algorithm**

Begin

Step1) Source want to send some data to the destination ,before sending the data it send hello packet to all neighbour nodes and further process according to AODV routing protocol.

Step2) In optimised LEACH the motive is to save energy as much as possible. So in clustering, all clusters are not active at all time. When they are required is will be activated.

Step3) Most of time clusters will be in idle condition. By applying new level keyword in code.

Step4) if new\_level >= 0

if consumed\_energy = new\_level\_energy then extend

(New level is nothing but updated energy) expand the energy by taking from neighbour.

Step5) When sometime the node may get decrease processing energy. It need to be calculated so that new level will be checked periodically.

By checking three attributes number\_instructions, double\_instructions\_per\_second and double\_processing\_power.

Step6) if instructions\_per\_second == 0

Terminate the process and calculate processing time and consume energy.

Step 7) It will check all communicated nodes and assign to zero for next simulation.

Step 8) If given energy <= consume energy

then energy = 0;

else remaining energy over

energy = energy – consume energy

### **RESULTS AND DISCUSSIONS**

In this section, researchers are going to explore the results of their modified algorithms. The modified algorithms are to be compared with the existing algorithm. For exploration and discussion Researchers have taken On-demand (Reactive) routing

protocol routing protocol named as On-demand Distance Vector (AODV). The existing protocol of AODV is compared with the modified AODV and then conclusions have been drawn about the performance [9]. Researchers have completed their research with different parameters as discussed above the parameters are:

Packet Delivery Fraction (PDF),  
Throughput,  
Normalized routing load Parameters,  
Energy.

#### **Execution of AODV Base and Proposed Protocol**

By using, the above parameter with AODV protocol researchers have executed the basic protocol as well as proposed AODV protocol and the snapshot of execution of various parameters such as PDF, Throughput, NRL and Energy by using ns2 is presented in researcher's research. In this scenario, some parameters with a specific value are considered. Those are in above table1. The values of these parameters are same in both base protocol and proposed protocol. Researcher experiment starts with the execution of AODV Base protocol and the results of the experiment is copied below and as the same Researcher has executed the AODV proposed protocol and the result is presented below. After the outcome of both AODV Base and AODV Proposed protocol now researcher can easily inspect the difference in between AODV Base and AODV Proposed. Researchers have repeated the experiment number of times and ultimately researchers find that in each execution the AODV Proposed protocol gives better results than the AODV base protocol. Therefore, researchers concluded that their AODV proposed protocol approach is better than the AODV base protocol. In this execution researchers have shown only one experiments of (AODV base and AODV proposed) to view the differences [10]. The values of experiments are presented sequentially termed as:

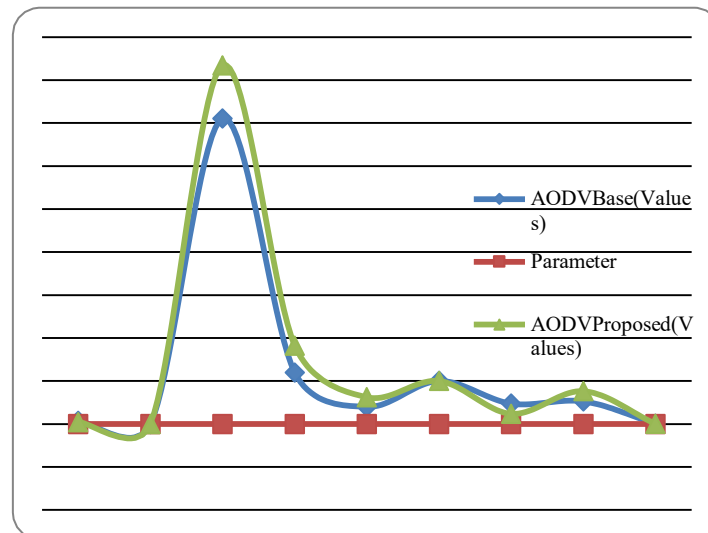
**Table-2: AODV BASE: Test**

Parameter	Values		Parameter	Values
Normalized Routing Load	70.031		Normalized Routing Load	45.549
Packet Delivery Ratio	0.1684		Packet Delivery Ratio	0.2186
Send Packets	7109		Send Packets	8344
Receive Packets	1197		Receive Packets	1824
Average Throughput[kbps]	400.18		Average Throughput[kbps]	622.45
Total energy	1000		Total energy	1000
Total consume energy	473.32		Total consume energy	236.5
Remaining energy	526.68		Remaining energy	763.5
Average of consume energy	4.7332		Average of consume energy	2.365

**Table-3: AODV Proposed: Test**

Sources: Authors Compilation

**Figure-1: Comparison Graph of Simulation**



Sources: Authors Compilation

## CONCLUSION

The research emphasized on protocol implementation and testing that covers simulation workflow, which includes number of steps that are used in the activity of simulation. The initially activity of simulation is to check out the scenario and topology that is using at the time of simulation. The next step is to generate the traffic file by using TCL script. Another step is to execute the TCL script by using NS command. By executing the TCL script, the Trace and NAM file is auto generated. The next step is to decide the performance of parameter (NRL, PDR, energy and throughput). The next step is to execute the AWK script to evaluate performance. The last step is to store performance data. All the steps required to be executed properly to view the outcome in expected manner.

After the understanding of different steps, researchers started their research work with the implementation of AODV protocol, the basic protocol of AODV has been discussed, route discovery and performance results have been discussed by using different parameters. The result generated during simulation is stored for the comparison purpose (comparison with the Proposed AODV protocol). After the discussion and result generation, it is time to explore proposed model for AODV using LEACH (Hierarchical Routing). Execution of base and proposed AODV under various parameter that are explained earlier uncovers the difference between AODV base and AODV proposed.

Finally researcher come to a situation where researcher can say that the base AODV protocol that is existed earlier can work in a better way by doing some little modifications [11][12].

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## **LITERATURE SURVEY OF GIS AND STUDY OF FILTERING TECHNIQUES FOR NOISE REMOVAL FROM REMOTELY SENSED IMAGES**

Nitin Pandey<sup>9</sup> Dr. Manoj Kumar Pandey<sup>10</sup>

### **ABSTRACT**

*This paper presents literature survey of GIS, comparative and analytical study among various filters which are usually used for reducing noise from remotely sensed data. During this study several band images from resourcessat-1/ resourcessat-2 satellite using LISS-3/LISS-4 sensors are taken and passed to various filters such as frequency and spatial domain filter for analyzing them using MSE and PSNR to measure their performance in terms of Gaussian noise, salt and pepper noise, feature extraction as well as in terms of effectiveness and efficiency.*

### **KEYWORDS**

**Wiener, Homomorphic, Sobel, GIS, LISS, SAR, MSE, PSNR, Gaussian, Gradient etc.**

### **INTRODUCTION**

In Digital image processing, reduction of noise from images which are captured by sensors of satellite is a challenging task from decades. Many techniques are implemented for reducing speckle noise, salt and pepper noise, Gaussian noise from satellite or radar images. Feature extraction, edge detection, work over components of GIS is also an interested area in GIS.

### **LITERATURE SURVEY of GIS or REMOTELY SENSED DATA**

Reducing noise from the satellite's images is a challenge for the researchers in digital image processing. Several approaches are available for noise reduction. Generally speckle noise is commonly found in synthetic aperture radar images, satellite images [1][2][3]. In remote sensing, information of objects is acquired using technical methods without physical site observation.[4]. Remote sensing consist of several statistical and mathematical methods for measuring radiation of electromagnetic signals about an object or number of objects which resides in long distance for the extracting useful information about them.[5]. Remote sensors are used to capture information about target, objects or area for processing them to analysis of certain information. Remote sensing is used to obtain information about a target or an area or a phenomenon through the analysis of certain information, which is obtained by the remote sensor [6], [7]. Felix Bachofer and co-writer identified that Paleo-shorelines and ancient lake terraces east of Lake Manyara in Tanzania and they were detected from the backscatter intensity of TerraSAR-X StripMap images. This study compares the performance of different combinations of speckle reduction techniques and edge operator in detecting linear paleo-shorelines. The Roberts, Sobel, Laplacian of Gaussian and the Canny edge detector algorithms were applied to extract and revise those linear structures. The comparison shows that the Canny edge detector is especially suitable for images with strong speckle noise [12]. Through this paper writer analyzed effective filtering methods for enhancement of image taken from LISS4/P6 that is satellite of sensing the remotely images which senses images around infrared band. During this study writer used wiener filter, median filter, Gaussian homomorphic filter, and bilateral filter to reduce gaussian and salt and pepper noise. Writers concluded through MSE and PSNR that homomorphic filtering technique with gaussian method is the best [13]. During this work writers propose a novel despeckling algorithm for synthetic aperture radar (SAR) images based on the concepts of nonlocal filtering and wavelet-domain shrinkage. They told and follow the structure of the block-matching 3-D algorithm, recently proposed for additive white Gaussian noise denoising, but modify its major processing steps in order to take into account the peculiarities of SAR images. A probabilistic similarity measure is used for the block-matching step, while the wavelet shrinkage is developed using an additive signal-dependent noise model and looking for the optimum local linear minimum-mean-square-error estimator in the wavelet domain. [14]. During this study writers proposed a general methodology (PURE-LET) to design and optimize a wide class of transform-domain thresholding algorithms for denoising images corrupted by mixed Poisson–Gaussian noise. They express the denoising process as a linear expansion of thresholds (LET) that they optimize by relying on a purely data-adaptive unbiased estimate of the mean-squared error (MSE), derived in a non-Bayesian framework. [15]. T. M. Lillesand told classification of remote sensing images constitutes a challenging problem because of potentially high dimensionality of images and lower number of training samples, the spatial variability of spectral signature, and presence of noise and uncertainty of data[16]. In this paper proposed a two-phase scheme for removing salt-and-pepper impulse noise. In the first phase, they use an adaptive median filter is used to identify pixels which are likely to be contaminated by noise. In the second phase, the image is restored using a specialized regularization method that applies only to those selected noise candidates. In terms of edge

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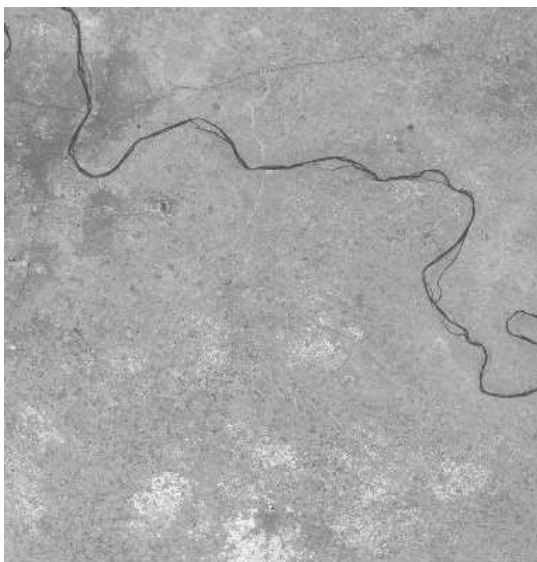
preservation and noise suppression, restored images shown a significant improvement compared to those restored by using just nonlinear filters or regularization methods only. This scheme can remove salt-and-pepper-noise with noise level as high as 90% [17]. In this paper writer analyzed and told that Synthetic aperture radar (SAR) images are inherently affected by multiplicative speckle noise, which is due to the coherent nature of the scattering phenomenon. In this paper writer and co-writer proposes a novel Bayesian-based algorithm within the framework of wavelet analysis, which reduces speckle in SAR images while preserving the structural features and textural information of the scene. First, they show that the sub band decompositions of logarithmically transformed SAR images are accurately modeled by alpha-stable distributions, a family of heavy-tailed densities. Consequently, they exploit this a priori information by designing a maximum a posteriori (MAP) estimator. Finally, they compare their proposed method to current state-of-the-art soft thresholding techniques applied on real SAR imagery and they quantify the achieved performance improvement [20]. During this study, writer introduces a total variation (TV) regularization model for synthetic aperture radar (SAR) image despeckling. A dual-formulation-based adaptive TV (ATV) regularization method is applied to solve the TV regularization. The parameter adaptation of the TV regularization is performed based on the noise level estimated via wavelets. The TV-regularization-based image restoration model has a good performance in preserving image sharpness and edges while removing noises, and it is therefore effective for edge preserve SAR image despeckling told by writer [21]. In this work, they have applied various filters on remote sensing images for de noising them. In a simulation, they took remote sensing images and analyzed it with an Average filter, Median filter, un sharp filter and Wiener Filter and using statistical quality measures. The analysis of effect of noise removal technique is given in this paper [22].

## MATERIAL AND METHODS

During this study, I have taken band images from resourcesat-1/ resourcesat-2 satellite using LISS-3/LISS-4 sensors through Indian Geo-Platform of ISRO [29]. Self-Scanning Sensor (LISS) capture band images, which operates in three different spectral bands in VNIR named band2, band3, band4 and one band in SWIR with 24-meter spatial resolution and a swath of 141 km. This data is received from Linear Imaging and Self-Scanning Sensor (LISS) we have taken following two images. The first one data is the image of urban area of Agra District in Uttar Pradesh taken on two different dates and the second one data is the image of urban area of Mathura District in Uttar Pradesh. We have cropped three images from data filtering. The detail of images is given as follows:

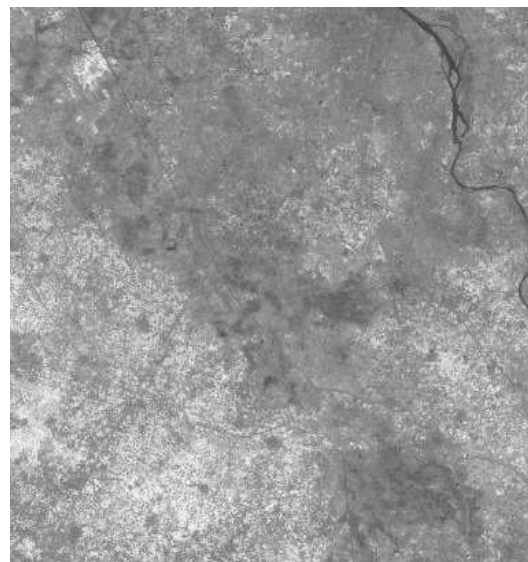
**Figure-1**

Uttar Pradesh: Agra District  
Taken from Resourcesat-1/Resourcesat-2 through  
LISS-3/LISS-4, through ISRO.



**Figure-2**

Uttar Pradesh: Mathura District  
Taken from Resourcesat-1/Resourcesat-2 through LISS-  
3/LISS-4, through ISRO.



**Sources:** Authors Compilation



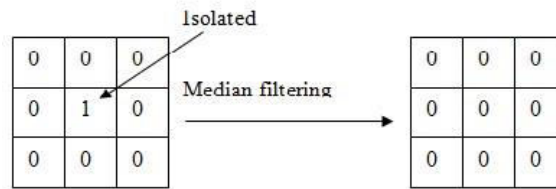
# **SPECIFICATION OF FILTERS FOR REDUCING NOISE FROM REMOTELY SENSED DATA**

## **Median Filter**

Median is the mid value of any given data set. In median filtering every and each pixels is replaced by the grey level median of neighborhood pixels. [24.] We can understand it by  $x(n)$  and  $y(n)$  as:

$$\text{median } x(n) \quad y(n) \quad \text{median } x(n) \quad \text{median } y(n) \dots\dots\dots(i)$$

**Figure-3: Median Filtering**  
 (Taken from *Digital Filters: Analysis and Design*[24])

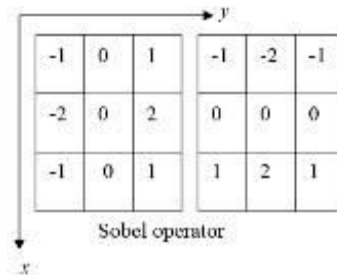


**Sources:** Authors Compilation

## **Sobel Operator[25]**

The operator consists of a pair of 3×3 convolution kernels as shown in Figure 1. One kernel is simply the other rotated by 90°.

**Figure-4: Sobel Filter**  
 (Taken from *Digital Filters: Analysis and Design*[25].)



**Sources:** Authors Compilation

The kernels of sobel are designed horizontally and vertically. For input image kernels are applied for measuring the gradient  $G_x$  and  $G_y$ . These gradients are:

$$G_x = x_7 - 2x_8 + x_9 \quad x_1 - 2x_2 + x_3 \dots\dots\dots(ii)$$

$$G_y = x_3 - 2x_6 + x_9 \quad x_1 - 2x_4 + x_7 \dots\dots\dots(iii)$$

It is a common practice to approximate the overall gradient by taking the sum of the absolute values of these two:

$$f = |G_x| + |G_y| \dots\dots\dots(iv)$$

The *direction* of the gradient is:

$$\tan^{-1} \frac{G_x}{G_y} \dots\dots\dots(iv)$$

### Wiener Filter

The method of wiener filter works between undegraded and original image to find out optimal solution and it enforce a minimum mse constraint. [26][27]. During application of wiener variance and local mean around each pixel is calculated.

$$\mu = \frac{1}{n_2} \sum_{n1, n2 \in \eta} \diamond(n1, n2) \quad \dots\dots\dots(vi)$$

$$\diamond^2 = \frac{1}{n_2} \sum_{n1, n2 \in \eta} \diamond^2(n1, n2) - \mu^2 \quad \dots\dots\dots(vii)$$

here n is N\*M neighbourhood pixel. Following estimate is used to create wiener filter using pixel wise:

$$\diamond(n_2, \diamond(n_1)) = \mu \frac{\diamond(n_2, \diamond(n_1)) - \mu^2}{\diamond^2} \quad \dots\dots\dots(viii)$$

here  $\nu^2$  is called the variance of noise. If variance noise variance is not given, then two-dimensional uses the average of all local estimates [28].

### Gaussian Homomorphic Filter

It is a technique of filtering for frequency domain. It is used for signed and image processing, it is involved in non-linear processing to different domain where we can apply the techniques of linear filtering . Brightness is also normalized and Gaussian noise is also removed.

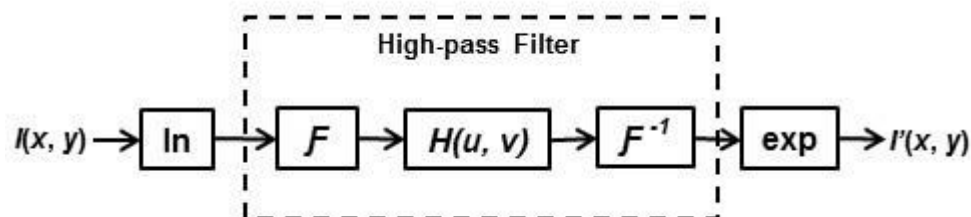
### Gaussian Noise

Gaussian noise is statistical noise having a probability density function equal to that of the normal distribution, which is also known as the Gaussian distribution [30], [31]. During the process of acquisition Gaussian noise is arisen. We can understand it through p that is probability density function name and z this is Gaussian random variable,  $\mu$  is the mean value.

$$P_{\diamond} = \frac{1}{\sigma \sqrt{2\pi}} \exp\left(-\frac{(z-\mu)^2}{2\sigma^2}\right) \quad \dots\dots\dots(ix)$$

Here we have to take some steps to apply homomorphic at first we make high pass filter may be Gaussian high pass. Then we have to fill image with zeros. Filter size must be (M,N). Then standard deviation for the Gaussian should be filtered out. Then, high-pass filters the log-transformed image in the frequency domain. Calculate the FFT of the Log-transformed image with zero padding using fft2. Then high pass filter is applied to calculate inverse FFT. And finally exponential function is applied to invert the log transformation.

**Figure-5: Homomorphic Filtering[32]**



Sources: Authors Compilation

### Mean Square Error (MSE)

It is the cumulative squared error between the original image and the filtered image and is given by the following equation[23]:

$I(x,y)$  = Image before filtering,  $I'(x,y)$  = Image after filtering, M, N = dimensions of the image



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D = 255 (for unit8 data type) or 1 (for double data type).

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$$MSE = \frac{1}{D} \sum_{d=1}^D [I(d) - \hat{I}(d)]^2 \quad \dots\dots\dots(x)$$

**Peak Signal to Noise Ratio (PSNR)**

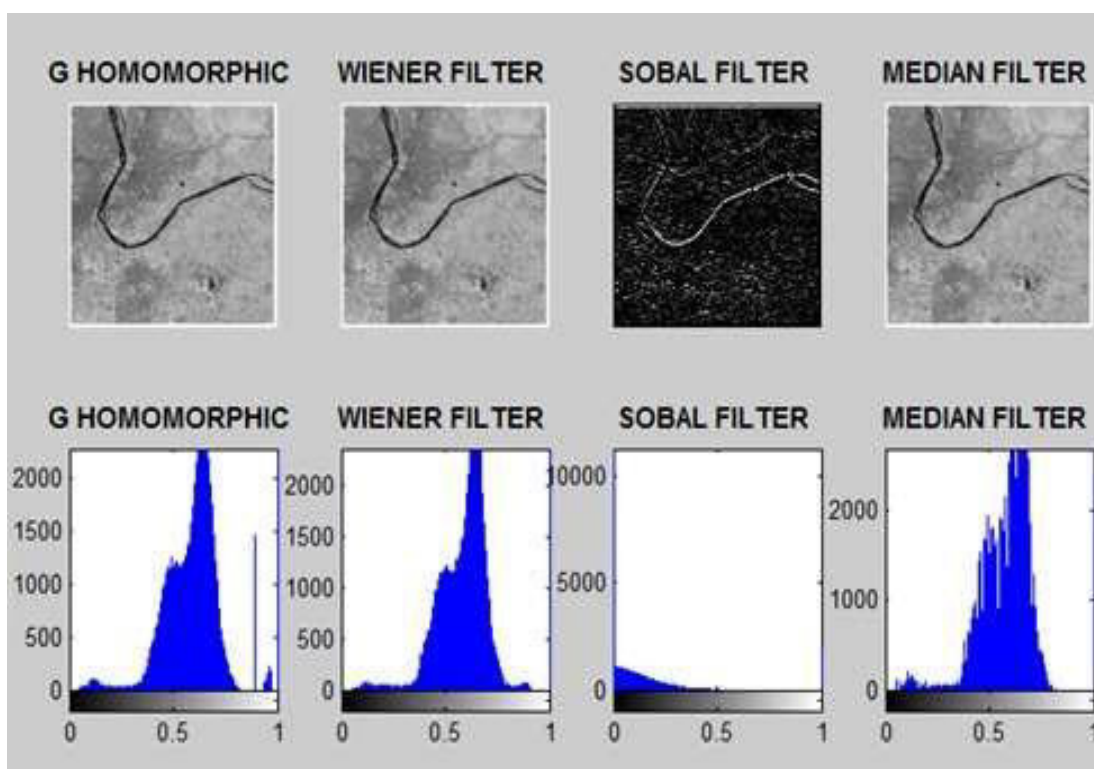
The term peak signal-to-noise ratio (PSNR) is a technique or method for the ratio between power of distorting noise and the maximum possible value that make impact on the quality of representation. Because many signals have a very wide dynamic range, (it is a ratio between smallest values of changeable quantity and the largest values). We can illustrate and express PSNR in the form of logarithmic decibel scale. It is the measure of the peak error in the signal and is expressed mathematically by the following equation[29]:

$$PSNR = 20 \log_{10} \frac{D}{\sqrt{MSE}} \quad \dots\dots\dots(xi)$$

**Result and Discussion:** After applying filters, Result is given below:

**Result 1**

**Figure-6: Taken from Figure 1**



**Sources:** Authors Compilation

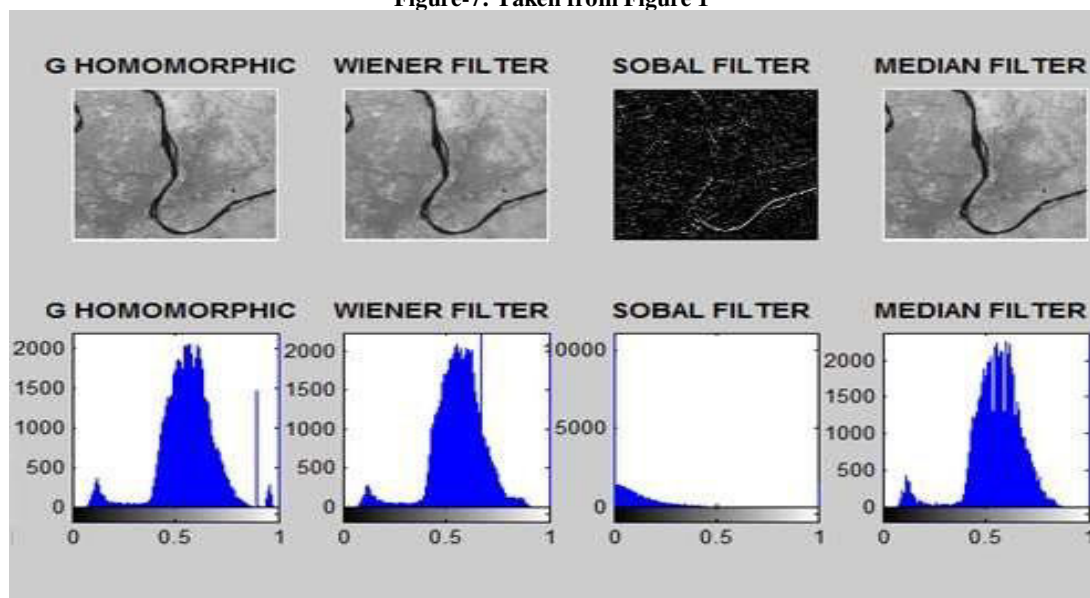
**Table-1**

Image Filters	Gaussian Homomorphic Filter	Median Filter	Wiener Filter	Sobel Filter
MSE	.0008	.0033	.0066	1.91
PSNR	30.77	24.85	21.81	-2.81

**Sources:** Authors Compilation

**Result 2**

**Figure-7: Taken from Figure 1**



Sources: Authors Compilation

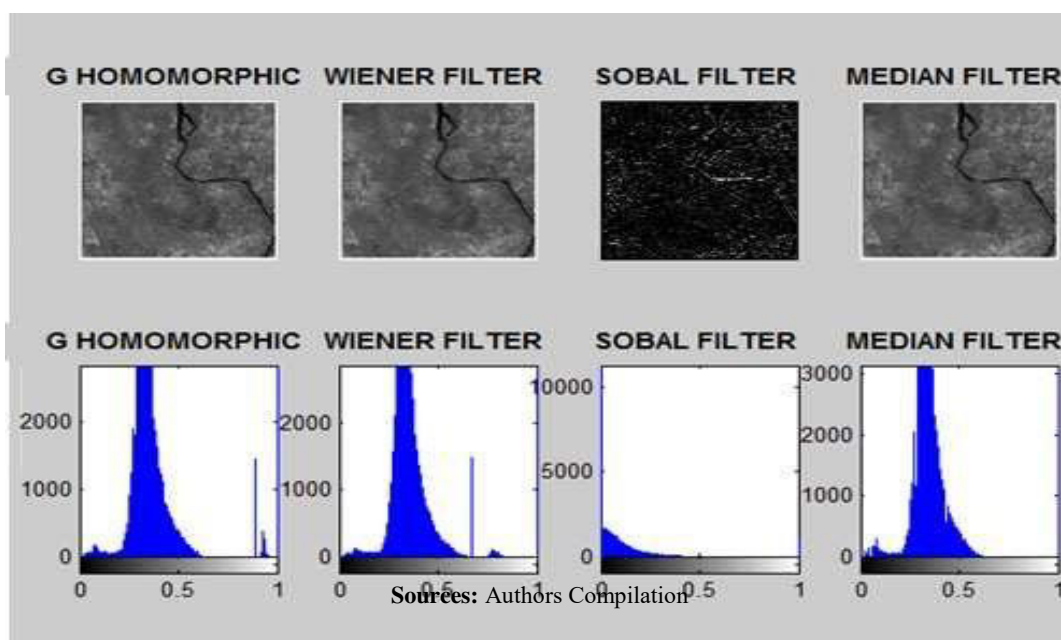
**Table-2**

Image Filters	Gaussian Homomorphic Filter	Median Filter	Wiener Filter	Sobel Filter
MSE	.0009	.0039	.0071	1.912
PSNR	30.25	24.10	21.46	-2.82

Sources: Authors Compilation

**Result 3**

**Figure-8: Taken from Figure 2**



Sources: Authors Compilation

Table-3

Image Filters	Gaussian Homomorphic Filter	Median Filter	Wiener Filter	Sobel Filter
MSE	.00074	.0033	.0058	1.66
PSNR	31.29	24.84	22.38	-2.19

Sources: Authors Compilation

## CONCLUSION

During this study I have read various national and international papers about remote sensing and GIS system, selected various remotely sensed images, read lots of algorithm for reducing noise and analyzed them using PSNR and MSE to evaluate their performance. Here I have taken the images Resourcesat-1/Resourcesat-2 through LISS-3/LISS-4, through ISRO and tried to extract edges majorly for roads. During practical implementation of existing filters named Median, Wiener, Sobel, and Gaussian homomorphic for selected images I've seen that the performance of sobel filter is worst and the performance of Gaussian homomorphism is the best in term of extracting edges for roads but what I see they are good for extracting edges of road but blurs or lost other information, may be other minor roads or edges.

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