CRITERIA 3

RESEARCH, INNOVATIONS AND EXTENSION

3.3.1 Number of research papers published per teacher in the Journals notified on UGC website

3.3.1 Number of research papers published per teacher in the Journals notified on UGC website during the last five years

2020-21

SL No	Title of Paper	Name of Author
1	A Study on Level of Awareness And Problems Faced By Investors Towards Post Office Saving Schemes	Ms.Gifi Felix
2	A study on big data analytics and visualization tools with special reference to data on covid 19	Ravitha Sudhakaran, Remya Raveendran
3	E Judiciary System-Accessing Justice In A Virtual World	Ms.A.Arsha
4	A Comparative Study On Consumer Protection Act Of 2019 And 1986	Ms.Aiswarya Murali
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6	E Judiciary System-Accessing Justice In A Virtual World	Ms.Aiswarya Murali
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A STUDY ON LEVEL OF AWARENESS AND PROBLEMS FACED BY INVESTOR'S TOWARDS POST OFFICE SAVING SCHEMES

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A STUDY ON LEVEL OF AWARENESS AND PROBLEMS FACED BY INVESTOR'S TOWARDS POST OFFICE SAVING SCHEMES

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ABSTRACT
Post office saving bank has been emerging with new pattern of schemes to attract investors. It provides an opportunity and habit for the poor and rural people to invest in various schemes. The study focused on the rural investor's level of awareness, motivational factors to invest their savings in post office bank. The study also identify the various problems faced by investors with the post office financial saving schemes like post office saving deposit, Post office Recurring Deposit and Post office Monthly Income Scheme.

Keywords: Rural Investors, Postal Saving bank, financial services

I. INTRODUCTION

India post is one of the biggest financial institutions which is playing a crucial role in providing financial support and services to the public. For more than 150 years, the Department of Posts (DoP) has been the backbone of the country's communication and has played a crucial role in the country's social economic development. People have a habit of saving attitude for better future. They expect maximum return with less risk. Poor people needs safety and secured place to invest their money. The government of India provides such a trustworthy financial bank through post office. It's available to everyone especially in rural area. Given below the different saving schemes offered by Indian Post Office.

Types of Savings Schemes

Presently, the government provides 9 **postal saving schemes** for investment by the general masses. They are enumerated below.

- **Public Provident Fund (PPF)**

PPF is one of the preferable schemes and is available with a lock-in period of 15 years. Nonetheless, investors can avail partial withdrawal after 5 years. A minimum deposit of Rs. 500 per year is required to keep the account active.

- **National Savings Certificate (NSC)**

You can invest in NSC with a small deposit amount of Rs. 100 as a single individual, jointly or as a guardian of a minor. The lock-in period for this scheme is 5 years. Also, the annual interest on NSCs is re-invested and paid out as an accumulated amount at the time of maturity.

- **Post Office Monthly Income Scheme**

This **post office monthly savings scheme** is another reliable savings instrument that allows you to invest a maximum of Rs. 4.5 Lakh individually and Rs. 9 Lakh jointly. As an MIS plan, it allows investors to generate a steady monthly income.

- **Sukanya Samriddhi Account**

SSY Scheme Under this **Indian post office saving scheme**, parents or legal guardians of any girl child up to 10 years of age are eligible to open this account in the child's name. A maximum of 2 accounts is allowed for a household for two daughters individually. Once the child reaches 21 years of age, she is eligible to claim the maturity amount.

Maturity of the account also differs as per the girl child's age on the date of enrolment. Thus, with a limit of up to 10 years of age, the maturity term will be accordingly extended from 21 years of age. Like, if the child was 5 years old on the date of enrolment, the year of maturity will be 21 years + 5 years, i.e., 26 years.

- **Senior Citizen Savings Scheme**

Investors who are 60 years old, or 55 years old in case of voluntary retirement, can deposit up to Rs. 15 lakh over their lifetime in a Senior Citizen Savings Scheme to earn regular interest income. The plan also comes with a lock-in period of 5 years.

- **Post Office Savings Account**

You can also open a savings account with the post office, which is similar to savings accounts opened with banks, by depositing a minimum of Rs.20. Also, you must maintain the account with a minimum of Rs.50. India Post also allows you to transfer money in your **post office savings account online.**

- **5-Year Post Office Recurring Deposit Account**

With small monthly investments, you can opt for as many RD accounts as you want with a post office. These investment options allow you to make periodic deposits while enabling substantial corpus creation over the tenure of investment.

- **Post Office Time Deposit Account**

You can also open time deposits as a **post office saving scheme** for 1, 2, 3 and 5 years of tenure. Even minors over 10 years of age can invest in time deposits along with a guardian. The savings option is similar to fixed deposits offered by banks.

- **Kisan Vikas Patra (KVP)**

KVP certificates allow you to earn double the deposit amount in 9 years and 10 months. Also, the deposit can be enchased only after 2.5 years against the payment of a nominal penalty.

Advantages of the Post Office Investment- Saving Schemes in India

a. Easy to invest

The saving schemes are easy to enrol and are best suited for both rural and urban investors. Anyone who wants to hedge risk in the portfolio for a fixed decent return can invest in these schemes. The simplicity and availability make these investment options a much-preferred savings cum investment option.

b. Documentation and procedures

Limited documentation and proper procedures in post office ensure that these saving schemes are simple to opt for and safe to be locked onto as the government backs them.

c. Investments in the Post Office Schemes

The investments in the Post Office Schemes are more forward-looking and long-term oriented with the investment period extending up to 15 years for a PPF account. Therefore, these investment options are an excellent option for retirement and pension planning.

d. Tax exemption

Most of these schemes are eligible for tax rebates under Section 80C for the deposit amount. Few of the schemes like the PPF, the SCSS, the Sukanya Samriddhi Yojana, etc. also have the interest earned amount exempted from taxation.

e. Interest Rates

Interest rates in these schemes range from 4% to 9%, which is also risk-free. There is a minimal amount of risk involved, as the Government of India undertakes these investment options.

f. Different buckets of products

There is a wide range of products based on different types of individuals. Public Provident Fund (PPF), Kisan Vikas Patra and Sukanya Samriddhi Yojana are some of the more well-known schemes.

The government has made these small savings schemes available via post offices to provide a safe investment avenue for the public. By providing them with good returns and keeping their investments safe, these schemes are easy to manage. If the features and benefits iterated above meet your financial goals, then invest in a post office savings scheme to secure your financial future at minimal risk.

II. REVIEW OF LITERATURE

Martin (1997) suggests that the substantial rise in domestic saving is the prerequisites for putting India on a high growth path and small saving schemes are the most liked financial instruments for investors due to their secured and guaranteed return.

Gavini and Athma (1999) were of the view that those social security tax incentives in case of urban areas and old age security in rural areas were the main reason for investment in these schemes and suggest that government should promote social security schemes in India. Kisan Vikas Patra, Indira Vikas Patra (IVP), and Recurring Deposit were the most popular schemes in both urban as well as in rural areas due to higher rate of returns.

Karthikeyan (2001) observed the significant difference in awareness level about various schemes among different age group persons and the overall score confirmed that older investors were more aware than the younger one. Life Necessities and tax benefits were the two major ones factors that influence the investors both in semi-urban and urban 6 areas. Majority investors of both semi-urban and urban areas were very much willing to invest in small savings schemes in future provided they have more for savings.

Pillai and Kaushalya (2002) recommended that the small saving schemes with short-term maturity can be retained for the purpose of providing avenues to the rural households for savings mobilisation and to serve the objectives of providing the social security cover to the investors.

Singh (2002) confirmed that post office saving account, recurring deposits account, time deposits account are recurring in nature and functions in the same way as commercial banks.

Kumar (2008) also observed that Small savings schemes provide simple and reliable savings avenues to lower and middle income groups.

Ganapathi (2010) studied that various Small Saving Schemes were mainly meant to help the small investors and investing their amount in Post Office deposits provides safety and security for the amount invested. Proper advertisements must be made for Post Office Savings Schemes, so that even a layman could know about these Schemes and deposits can be increased.

Mathivannan and etc.(2011) concluded that school teachers are actively using post office small saving as one of the best alternative to diversify their portfolios.

Jain (2012) also found that most of the school teachers are saving their money as deposits in small saving schemes for their children's education, marriage and as security after retirement.

Similarly, **Ganesan (2012)** of the view that majority of the working women are being conservative by nature and are saving and investing to have a safe future.

III. OBJECTIVE OF THE STUDY

Following are the major objectives of the study.

- To analyze the investors level of awareness towards various investment avenues available in post offices.
- To analyze the intensity of problems faced by investors in post office financial Services.

IV. SCOPE OF THE STUDY

The study focused on the behavior of rural people in several financial services offered by post office. It highlighting the intensity of problems towards post office financial saving schemes in Aluva taluk in Ernakulam district of Kerala. This analysis is restricted only investors of postal saving scheme in the geographical area of Aluva.

V. STATEMENT OF PROBLEM

Post office serves different functions to the peoples living throughout the country. Financially it supports to Indian economy by making people investing money as savings. In the aspects of investments, the poor people need safety and others need maximum return with minimum risk. Government has encouraged the public to save their money for future needs through Post office bank. Post office saving schemes giving best returns for future and some of the scheme's return is

very less but the people have used to save. It is a reason to analyze the investor's awareness and level of problems towards post office saving schemes.

VI. RESEARCH METHODOLOGY

1. **Study Area -** The study covers Ernakulam district of Kerala.
2. **Sample Size** – 80 respondents who have invested in post office deposits schemes.
3. Sampling Method Used – Convenience sampling method
4. **Data Sources -** The study is based on primary data that has been collected using a structured questionnaire.
5. **Period of study** – November 2020 to January 2021
6. The first part of questionnaire is devoted to the basic information relating to the respondents such as age, gender, marital status, and income level, size of the family, education and occupation.
7. The second part of the questionnaire is made to get an idea of the investors towards Post Office Deposits Schemes.
8. **Statistical Tool Used**- Simple percentage, Garrett's Ranking Method, and Weighted Average Ranking Method
9. All the tests are carried out at 5% level of the significance.

VII. ANALYSIS AND INTERPRETATION

1. DEMOGRAPHIC PROFILE OF THE RESPONDENTS

The following table shows demographic profile of the respondents.

Table.1 Demographic Profile of The Respondents (Sample size 80)

Sl.No	Demographics		No. of Respondents	percentage
1	Age (in years)	Below 20	12	15.00
		31-40	39	48.75
		41-60	23	28.75
		61 and above	06	7.50
2	Gender	Male	22	27.50
		Female	58	72.50
3	Educational qualification	Illiterate	03	3.75
		School level	24	30.00
		Graduation	43	53.75
		Professional	08	10.00
		Others	02	2.50
4	Occupational status	Agriculture	20	25.00
		Employee	42	52.50
		Professional	10	12.50
		Business	08	10.00
5	Monthly income (in ₹)	Below 10000	13	16.25
		10001-20000	38	47.50
		20001-30000	22	27.50
		Above 30000	07	8.75
6	Number of earning members in family	1	3	3.75
		2	36	45.00
		3	25	31.25
		Above 3	16	20.00
7	Amount of savings per month (in ₹)	Below 1500	22	27.50
		1501-3000	30	37.50
		3001-6000	12	15.00
		Above 6000	16	20.00

Regarding the age level 12(15.00%) respondents age is less than 20, 39(48.75%) respondents age ranges between 21-40,23(28.75%) respondents age ranges between 41-60and the remaining 6(7.50%) respondents age is more than 61 and above. Thus most of the respondent's age ranges between 21 – 40 years.

Among the 80 respondents 22(27.50%) are male and 58 (72.50%) are female. Thus majority of the respondents are female.

About the educational qualification 3(3.75%) respondents are illiterate, 24(30.00%) educated up to school level, 43(53.75%) are graduated, 8(10.00%) are professionals and the rest 2 (2.50%) respondents are others. Thus, majority of the respondents are graduated.

Regarding to the occupational status 20(25.00%) respondents doing agriculture, 42(52.50%) are employees, 10(12.50%) are professionals and the remaining 8(10.00%) are doing their own business. Thus majority of the respondents are employees.

It is clear from the above table that, among the respondents 13(16.25%) have monthly income less than Rs.10000, 38(47.50%) respondents income ranges between Rs.10001-20000, 22(27.50%) respondents have income ranges between 20001-30000, and the remaining 7(8.75%) respondents have income more than Rs.30000 per month. Thus most of the respondent's income ranges between Rs.10001-20000 per month.

Regarding the number of earning members 3(3.75%) respondents have only single member earning, 36(45.00%) respondents have two earning members, 25(31.25%) respondents have three earning members and the remaining 16(20.00%) respondents have more than three earning members. Thus most of the respondents have two earning members in their family.

About the amount of monthly savings 22(27.50%) respondents are saves up to 1500 per month, 30(37.50%) saves between 1501-3000 per month, 12(15.00%) saves between 3001-6000 per month and the remaining 16(20.00%) respondent's saves above 6000 per month.

2. SOURCES OF INFORMATION ABOUT POST OFFICE SCHEMES

Following table shows the different sources of information about post office schemes.

Table 2 Source of information

Sl. No	Source of information	No. of respondents	Percentages
1	Friends and relatives	22	27.50
2	Agents	20	25.00
3	Post Office staffs	18	22.50
4	Self interest	10	12.50
5	Others	10	12.50
	Total	80	100.00

Source: Primary Data

The table shows that 22(27.50%) of the respondents are knowing various Post Office schemes through their friends and relatives, 20(25.00%) of them are known through post office agents, 18(22.50%) of them are known through post office staffs, 10(12.50%) of them are knowing through self-interest and the rest10 (12.50%) of them knowing through others like internet, books, newspapers etc….

3. AWARENESS ABOUT VARIOUS POST OFFICE SCHEMES

Following table shows the level of awareness among investors in Post Office Saving Schemes.

Table 3 Various schemes in post office

Sl. No	Various schemes	Very high	High	Moderate	Low	Very low
1	Post office savings deposit	40	26	10	4	-
2	Post office recurring deposit	15	25	20	14	06
3	National savings	15	18	8	19	20

	certificate					
4	Kissan vikas patra	8	10	19	21	22
5	Sukanya samridhi account	10	21	24	12	13
6	Senior citizen savings scheme	12	10	30	16	12
7	Fixed deposit	38	24	08	06	04

Source: Primary Data

The above table clearly shows that, majority of the respondents have high level of awareness about post office savings deposit, post office recurring deposit, post office fixed deposit and Sukanya samridhi account. The table also shows that respondents have low level of awareness about National savings certificate and Kissan vikas patra.

4. MOTIVATIONAL FACTORS FOR JOIN IN POST OFFICE SCHEMES

Following are the motivating factors to join in Post Office Saving Schemes.

Table 4 Motivating Factor – - KENDALL'S W TEST

Sl. No	Particulars	Mean	Rank
1	Get tax benefits	6.10	4
2	Meet emergency needs	3.21	9
3	Earn regular income	3.27	8
4	Easy formalities	4.12	7
5	Risk free investment	7.13	2
6	Well-being of my children	5.01	5
7	Family protection	6.14	3
8	Getting security during old age and retirement safety	4.92	6
9	Promote savings	7.83	1

Source: Primary Data

From the following table, it is clear that majority of the respondents prefer post office savings schemes because of promotion of savings with a mean score of 7.83 (rank 1st), followed by risk free investment 7.13 (rank 2nd), family protection with a mean score 6.14 (rank 3rd) and for getting tax benefit with a mean score 6.10 (ranked 4th), well-being of my children with a mean score 5.01 (ranked 5th), retirement safety with a mean score 4.92 (ranked 6th), easy formalities with mean score 4.12 (ranked 7th), earn regular income with mean score 3.27 (ranked 8th) and for meeting emergency needs with a mean score of 3.21 (ranked 9th).

5. KENDALL'S TEST

NUMBER OF RESPONDENTS	KENDALL'S VALUE	DF	P VALUE	S/SN	REMARKS
80	132.45	8	.000**	S	REJECTED

**1% SIGNIFICANCE LEVEL

This table lists the result of the Kendall's test. For these rankings, the chi-square value is 132.45,Degree of freedom is equal to the number of values minus 1.It is clear from the table that significance level is 0.000 at one percent level of significance. Hence, the hypothesis is rejected. At least one of the variable differs from others.

6. INTENSITY OF PROBLEMS

Following table shows the intensity of problems of investors in Post Office Saving Schemes.

Table 5 Intensity of problem (weighted Average Ranking Method)

Sl. No	Particulars	Mean score	Rank
1	Poor response from staffs	2.17	6
2	Delay in processing	4.63	4
3	More procedural formalities	5.39	2
4	Lack of customer friendly attitude	3.13	5
5	Lack of information	6.78	1
6	Low rate of interest	5.12	3
7	High risk	1.18	7

Source: Primary Data

From the above table it is observed that the major problems faced by the investors from post office schemes are lack of dissemination of information with a mean score of 6.78 (rank 1st), more formalities with a mean score 5.39 (rank 2nd) and low rate of interest with mean score 5.12 (rank 3rd).

VIII. FINDINGS

The following are the various findings of the study.

1. Majority of the respondents are female.
2. Most of the respondent's age ranges between 21 – 40 years.
3. Majority of the respondents are graduated.
4. Majority of the respondents are employees.
5. Most of the respondent's income ranges between Rs.10001-20000 per month.
6. Most of the respondents have two earning members in their family.
7. Friends and relatives, Post office agents and Post office staffs are the major source of information providers regarding to various schemes of post office.
8. Majority of the respondents have high level of awareness about post office savings deposit, post office recurring deposit, post office fixed deposit and Sukanya samridhi account.
9. Respondents have low level of awareness about National savings certificate and Kisan vikas patra.
10. Majority of the respondents prefer post office savings schemes because of promotion of savings, provides risk free investment and for family protection.
11. The major problems faced by the investors from post office schemes are lack of dissemination of information, low rate of interest.

IX. SUGGESTIONS

1. Most of the respondents are not aware about the various schemes provided by the post office. So post office department take necessary steps to give more awareness to public about the schemes through awareness campaigns and advertisement.
2. Some of the respondents said that the rate of interest is low when compared to other investment avenues, so postal department try to increase their interest rates.
3. Few of the respondents are facing a problem of poor response from the employees. So the government should appoint proper official to monitor all these issues.
4. In some of the rural post office, lack of computerization and technological issues are exists. Due to this customers are waiting for long time. So government should take care these issues.

X. CONCLUSION

In India postal department plays a vital role to boost the development of Indian economy. There are various financial activities introduced and encourages the people to invest their money to fulfilling their future needs. The present study concentrates on motivational factors that lead to invest in post office savings scheme, level of awareness among investors about the various schemes, also the study focused on the investor's behavior with various investment avenues available in the post office. The study concluded that investors have high level of awareness

about fixed and recurring deposits but low level of awareness regarding to sukanya samridhi scheme and kisan vikas patra'. In some of the rural post office, lack of computerization and technological issues are exists. Due to this customers are waiting for long time. So government should take care these issues.

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A STUDY ON BIG DATA ANALYTICS AND VISUALIZATION TOOLS WITH SPECIAL REFERENCE TO DATA ON COVID 19

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Abstract

In this digital era enormous data are generated from various sources and the transition from digital technology has lead to the growth of Big data. It is not the size but it is the value inside the data makes it Big Data. A huge effort is required for the analysis and interpretation of these data and their conversion to knowledge for decision making. Hence it is a potential area for research. An example is health care and epidemiological data such as data related to patients who suffered epidemic diseases like the corona virus disease COVID 19, which is helpful to researchers, epidemiologist and policy makers to handle the disease effectively. Big data tools like Sisense, Tableau, Datawrapper, Power bi, Qlik Sense, Apache Spark etc are used and among these most popular data visualization tools like Power BI and Tableau are discussed in this paper to find our which one suits the best for Covid big data. These tools helps the users to get a better understanding about the data. As pictures can communicate the ideas better than words visualization and visual analytics plays a major role in big data analytics.

Index Terms: Analysis, Big Data, COVID 19, DataWrapper, Infogram, Power BI, Qlik Sense, Sisense Tableau, Visualization

I. Introduction

Big Data refers back to the big extent of information that cannot be stored in a single laptop. It is the facts with so massive length and complexity that none of the traditional facts management equipment may be used to keep it or technique it efficiently. Big data technology can store a massive amount of information about the human beings infected with COVID-19 virus. This records may be successfully used for case identification and helping to allocate the sources for higher protection of public health. These information may be used to tune the virus on a international basis constantly and to create innovation in clinical fields. There are many large statistics visualization gear that can offer public health officers the capacity to peer how COVID-19 progress over the time. This study is to find the nice big data visualization tools suitable for the visualization of COVID-19 statistics by using comparing two maximum popular tools Tableau and Power BI.

II. Types of Big Data

Understanding in which the raw statistics comes from and how it must be treated earlier than analyzing it turns into vital depending at the quantity of large data. The structure of huge facts is not best a key to apprehend its running but also it indicates what insights it could produce.

Structured, Unstructured and Semi-structured

a. Structured

Any facts which will be stored, accessed and processed within the shape of fixed format in termed as structured.

b. Unstructured

Any records with unknown shape or the structure is classified as unstructured records. In addition to its massive length, unstructured information poses a couple of demanding situations in phrases of its processing for deriving price out of it.

c. Semi-structured

Semi-structured facts can include both the types of information. It may be dependent shape however it isn't always honestly described with a desk definition in relational DBMS.

III. 3 V' S OF BIG DATA

Big data can be defined in term of different characteristics.

a. Volume

As the name indicates the size of big data is enormous. The size plays an important role in determining value out of data. To determine a data as big data or not, is dependent upon the volume of data.

b. Variety

The term variety refers to the different sources and the nature to which the data belongs i.e, both structured and unstructured.

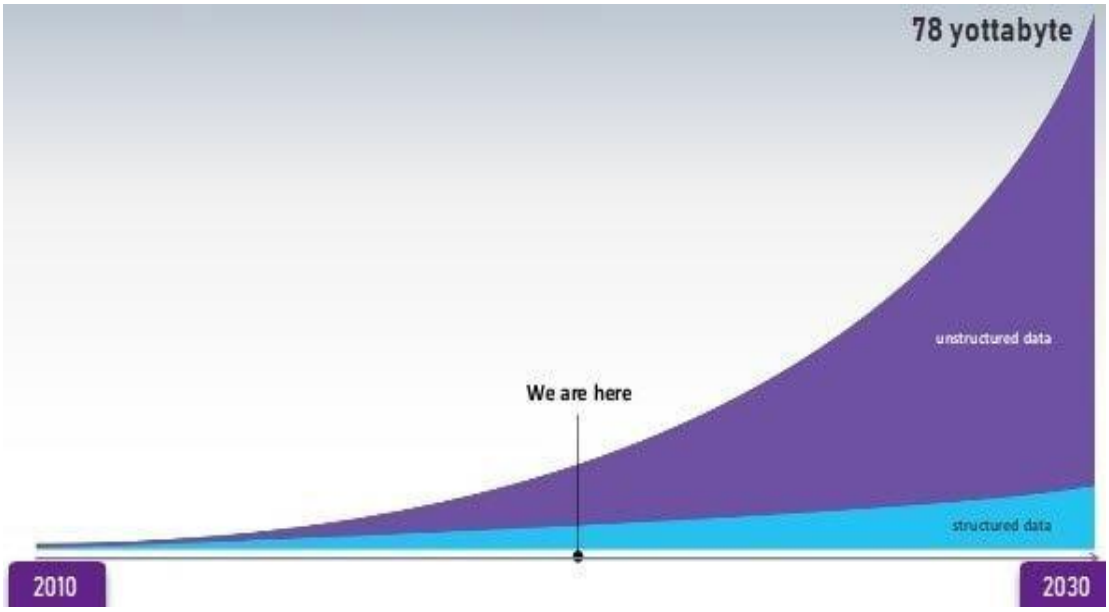

Figure 1. Growth of structured and unstructured data

Nowadays various forms of data like emails, photos, audio, pdfs etc are being considered in the explicit analysis.

c. Velocity

Velocity refers to the speed of generation of knowledge. How fast the info is generated and processed to satisfy the stress, determines real potential within the data.

IV. Big Data Visualization and Analytics

Big data analytics examines large amount of statistics to find hidden styles, correlations and other insights. With today's generation, it's possible to analyze the facts and get solution from it nearly without delay- an attempt that's slower and much less efficient with greater conventional commercial enterprise intelligence solutions. Huge quantity of records requires making use of big data analytical tools to make sense of pandemic and manipulate its spread in a timely manner. It provides real time monitoring of records. As photos can speak the ideas better than words visualization and visible analytics plays a chief role in large data analytics. Data can be visualized in 5 unique categories, it consists of temporal, hierarchical, community, multidimensional and geospatial.

V. Big Data and COVID-19 Visualization

As COVID data is received from one of a kind sources in a huge quantity in various amount, huge data may be used to symbolize these data. The on the spot outbreak of this sickness have created a critical source of data and knowledge. These data are wont to undertake studies and improvement approximately the virus, pandemic and measures to fight this virus and after results. Big data in this modern era may digitally keep a huge amount of records of those patients. It helps to computationally analyze to reveal styles, trends, associations and differences. It can also assist in revealing the insights into the unfold and manage of this virus.

With the unique shooting capability, big statistics may be used to minimize the chance of spreading this virus. A lot of faux records has additionally been generated regarding this pandemic. Hence the choice of dependable statistics from this statistics pool changed into one the various fundamental challenges faced by means of data analytics. In order to conquer this assignment authorities has standardized the source which data can be collected and utilized. Hence WHO and worldmeter acts as the two dependable supply of COVID-19 data. Proper evaluation of this collected data with a view to depict the desired statistics from those massive data is crucial (data analysis techniques).

Data visualization has been so important in communicating these data to the end customers. If the amount of information is small then it is able to be communicated through graphs or charts. But because the COVID-19 is handling quantitative records in a huge amount, data visualization must be accomplished in a comforting way of making sense and comprehensible in a simple manner. Basically data visualization as name indicates its visualizing data. The data is simply words, if we do no longer convey it in a comprehensible manner. Hence data visualization is a way to communicate and make feel of these data. In case of COVID-19, data visualization does now not simply performs a position of verbal exchange, it allows convince the humans to change their behavior. As the virus is spreading in a rapid manner, visualized data is cent percentage better than that of mere words.

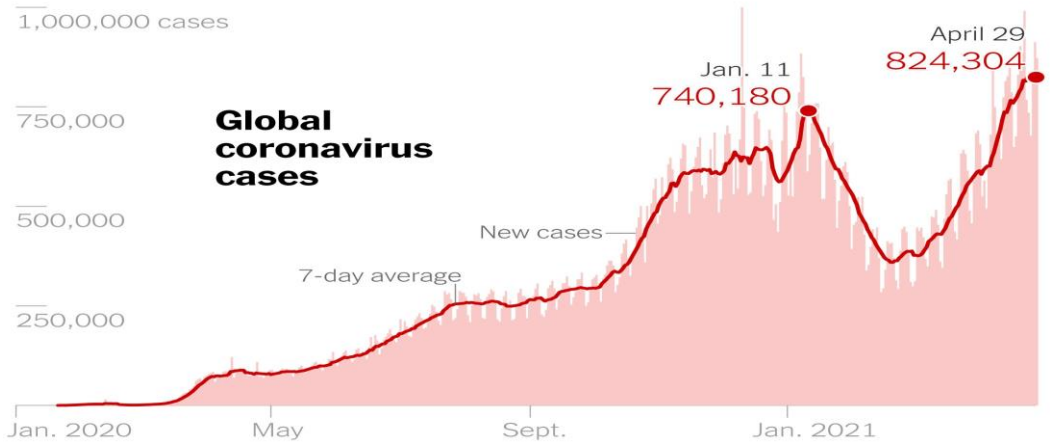

Figure 2. Graph of COVID 19 cases

VI. Big Data Visualization Tools for COVID-19

Data visualization tools enables the visualization designers to create visual illustration of large data units. While managing this data units which incorporates loads of hundreds or hundreds of thousands of data points for the system of creating a visualization, to an awesome extend make a designer's activity less difficult. These data visualization can be used for purposes like dashboards, facts reviews, income and advertising and marketing substances, investor slide decks and anyplace assist the information desires to be interpreted. There are positive not unusual functions for the great visualization gear. It consists of the ease in their use, highquality documentation, required tutorials, and also should be designed in this kind of manner that it feels intuitive to the user. The best visualization tool can manage more than one facts data in a single visual. The output of the tools may be specific charts, graphs and map types. Also the price connected to a tool have to be justifiable in terms of better support, better functions and with better values.

Visualization tools defers for every instance. The choice of the perfect visualization tool relies upon on what the requirement is. There are a whole lot of visualization tool to be had which can be Tableau, Google chart, Sisense, Fussioncharts, Qlik, Power BI, Domo, Polymaps and so forth. The data acquired from the analysis of COVID-19 are giant in different types. These data wishes to be carefully analysed, interpreted and visualized to be able to derive a proper conclusion from the data. Though there is quite a few visualization tools available the most famous tools are Sisense, Qlik Sense, Tableau and Power BI. In my study evaluating these tools to find the fine one appropriate for visualization of COVID data.

VII.Sisense

Sisense is the fastest software when compared to other as there is in chip memory available. It works well with larger volume of data. It helps in combining data from different sources. But while considering the covid data visualization it has some drawbacks.

- Gets slow when the data starts to grow very big.
- It is used mainly for data analysis rather than data visualization.
- Visualizations are difficult for common people to understand.

VIII. Qlik Sense

Qlik is a simple and interactive data visualisation tool which enable users to import and aggregate data from varied big data sources. It has an in-memory data storage of about 500MB. It is a self service Analytics. Qlik can manage small or big data within a single environment. But while considering the COVID data visualization it has some drawbacks. • Inflexible data extraction capabilities.

- Data solution is generally sluggish when working with large data sets.
- Very limited number of visualization types and each one has limited configuration (charts, styles, colours).

IX. Tableau

Tableau is a effective and rapid developing data visualization tool used within the Business Intelligence Industry. It enables in simplifying raw data in a very effortlessly comprehensible layout which will be understood by using professionals at any level in a commercial enterprise. It also allows non-technical users to create customized dashboards. Data analysis could be very rapid with Tableau and the visualization created are within the form of dashboards and worksheets. Data blending, real time evaluation and collaboration of data are the main capabilities of tableau. The tool has garnered interest among the people from all sectors along with commercial enterprise, researchers, different industries, and many others.

a. Pros

- Remarkable Visualization Capabilities.
- Ease of use

- High performance
- Multiple data source connections
- Thriving community and forum
- Mobile friendliness

b. Cons

- High cost
- Inflexible pricing
- Poor after sales support
- Security issues
- IT assistance for proper use
- Poor versioning

X. Current COVID-19 Report Visualized Using Tableau

Name	Casescumulative total	Cases newly reported in last 2 hours	Deaths-cumulative total	Deaths -newly reported in last 2 hours
Glob al	174,520,6 86	424,78 5	3,770,38 1	11,47 9
India	29,274,82 3	91,702	363,079	3,403

Table 1. COVID 19 report

The current covid report (June 11, 2021) as per WHO is given in the table format. As visuals can convey the ideas more clearly it can be represented using tableau. It shows the COVID cases from the starting till the date. It also provides the graphical representation of Death rate.

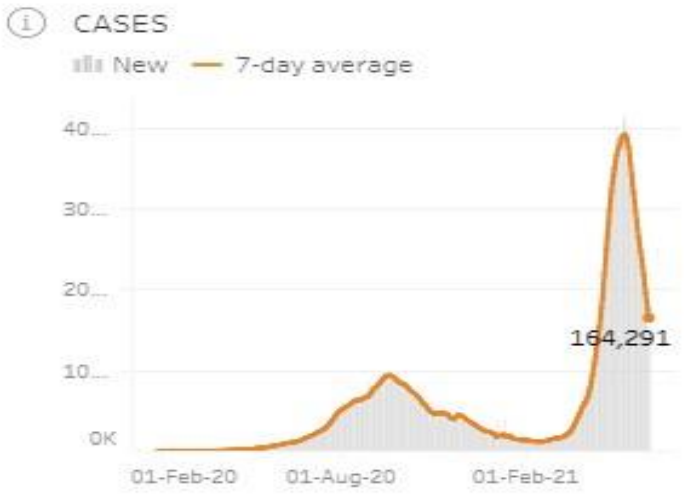

Figure 3. COVID cases

Figure 4. COVID deaths

XI. Power Bi

Power BI is a cloud based business intelligence provider suite by Microsoft. It is used to convert raw data into meaningful facts via the usage of intuitive visualizations and tables. One can effortlessly analyze facts and make crucial enterprise decision based totally on it. Power BI had sure capabilities for records visualization and evaluation through making sharable reports, dashboards, and apps.

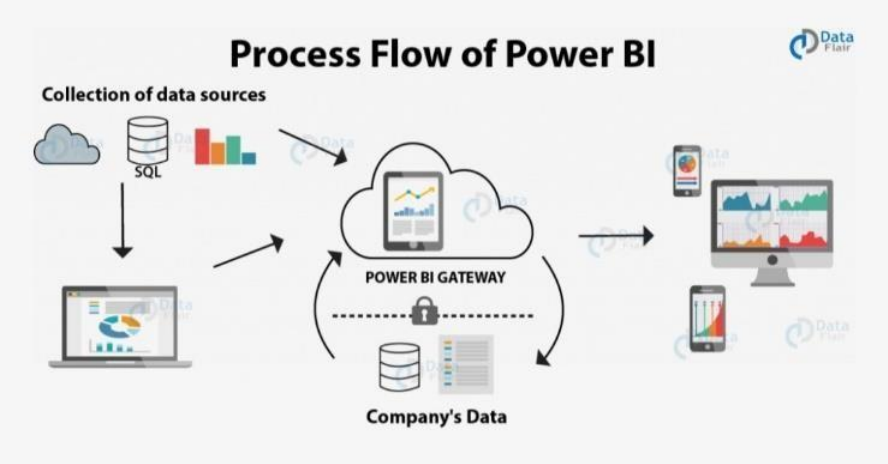

Figure 5. Process flow in Power BI

a. Pros

- Affordability
- Custom visualization
- Excel integration
- Data connectivity
- Data accessibility
- Interactive visualization

b. Cons

- Tables with complex relationships are difficult to handle.
- Less configuration of visuals.
- Rigid formulas
- Handling of large data volume is difficult
- Complex to understand and master.

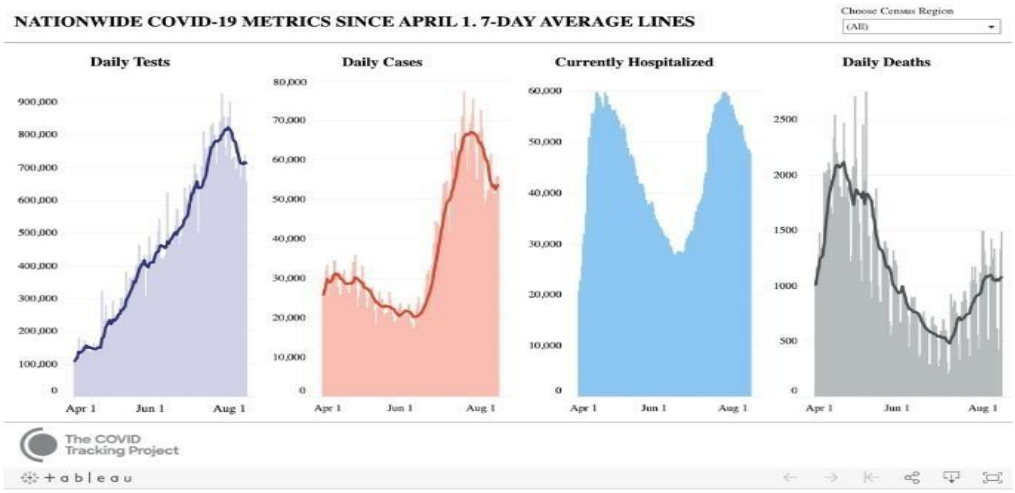

Figure 6. Graph of COVID Cases

The graph created using tableau shows the details of the comparison of daily confirmed covid cases, daily tests, currently hospitalized and death rate for 3 months. This visualization provides a better way to understand the data which in fact gives awareness to common people.

XII. What is Needed for a Good Tool ?

a. Every visualization tool is anticipated to transform raw records into eye beautiful charts and graphs and allow them to bring the hidden message in the records.

b. Tool should additionally have the functionality to examine and present the data in a digestible way.

c. The tool must be suitable in creating understandable data reports and dashboards by acquiring and aggregating massive and complex data from different sources.

d. Tool should be designed in a way that every user regardless of ability can learn to use it.

e. Filtering, processing etc of massive data need to be smooth.

f. The visualization have to be plenty and intuitive for any technical or non-technical person to apprehend it and draw significant insights from it.

g. Considering these elements Power BI and Tableau works hand in hand. The assessment of both these gives an idea approximately which one suits fine for covid data visualization.

XIII. Tableau or Power BI Suit Best for COVID-19

Tableau	Power BI
Tableau can handle a huge amount of data with better performance.	Power BI can handle a small amount of data.
24 different types of data visualizations are available for the users using Tableau.	Power BI provides huge data points to offer data visualization. It is offering quite 3500 data points for drilling down dataset.
Tableau suits the best for large amount of data found in the cloud.	Works better with a massive amount of data.
Used by analysts and experienced users.	Used by naïve and experienced users.
Can connect to numerous data sources.	Connects limited data sources
Has excellent customer support. For discussion tableau has a large community forum.	It provides less customer support to the one who uses it with a free power BI account.

Table 2. Comparison of Tableau and Power BI

- Tableau can cope with huge quantity of data with higher performance while power bi can cope with a limited volume of data.

- Tableau works pleasant when there is a huge data in the cloud but power bi doesn't work higher with large quantity of data.

- Since the data associated with COVID 19 is of massive extent it is able to be handled correctly using tableau. Tableau can create almost any sort of visualization with their platform, from a simple chart to innovative and interactive visualizations. Tableau is a high-quality choice for developing maps in addition to different sorts of charts. Covid data is collected specifically via path maps, the usage of GPS tracking etc. So for the evaluation and visualization of those sorts of data tableau will be the best choice.

Conclusion

The persisted spread of corona virus disease has affected the world terribly. A tremendous quantity of data iscollected regarding it to control the unfold of disease. These data may be treated with the assist of Big data tools. It appears that the present day human is far greater superior as to be stricken by a colourful eye-catching picture. Psychological research shows that 90% of all the information that people understand comes from their sense of sight. So for the right visualization and analysis of covid, Big data visualization tools can be used. Among the more than one Big data visualization tools to be had, there may be one answer that honestly sticks out first-rate for COVID data- “Tableau”, which enables to represent this sizeable data in so many visuals through which even common people get awareness of the disease.

Acknowledgment

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E JUDICIARY SYSTEM – ACCESSING JUSTICE IN A VIRTUAL WORLD

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Abstract: In today's parlance Information Technology or IT is synonymous with computers or the usage of computers for any ends. Information Technology is the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information by a micro-electronics based combination of computing and telecommunications. It is an umbrella term that includes any communication device or application, radio, television, cellular phones, wireless networks, computer and network hardware and software satellite systems and so on as well as the various services and applications associated with them such as video conferencing and electronic mail. The advent of Information Technology has necessitated many organizations to re-look in to their business process. The world around has significantly drifted in the flow of technology driven by internet and Information Technology. The courts are not an exception to ignore the ever-changing technological developments. Information Technology has found its way in to legal practice and as a part there of to the judiciary. With the help of Information Technology, the process of dispensation of justice has been made easier, more convenient, accurate, less time consuming and less expensive involving lesser manual labour. The introduction of Information Technology on a permanent basis will bring transparency in the entire system of administration of justice. The Indian Judiciary is in urgent need of re-engineering its processes by optimizes the use of its human resources and brings about change management by harnessing the potentiality of the available Information and Communication Technology (ICT) to its fullest extent. enhance judicial productivity both qualitatively and quantitatively as also to make the justice delivery system affordable, accessible, cost effective, transparent and accountable.

Keywords: E Judiciary, Information Technology, ICT, Virtual World.

Introduction: Information Technology is the acquisition, processing, storage and dissemination of vocal pictorial, textual and numerical information by a microelectronics based combination of computing and telecommunications.[1] It is an umbrella term that includes any communication device or application, radio, television, cellular phones, wireless networks, computer and network hardware and software satellite systems and so on as well as the various services and applications associated with them such as video conferencing electronic mail etc.

Technological developments in the field of information and introduction of computer have made a turning point in the history of human civilization. It has brought about a sea change in all fields of human activity. It has resulted in enhanced efficiency, productivity and quality of output in every walk of life. Extensive use of Information Technology by diverse organizations over the world has resulted in enhanced efficiency, effectiveness and optimal use of resources.[2] Computers as well as electronic communication devices such as facsimile machines[3] electronic mail, video conferencing, provide the ability to process large volumes of data with speed and accuracy exchange of useful information between different locations and support higher quality of decision making.[4]

The advent of Information Technology has necessitated many organizations to re-look in to their business process. The courts are not an exception to ignore the ever-changing technological

developments. It has been established beyond doubt that with the help of Information Technology the process of dispensation of justice can be made easier, more convenient, accurate, less time consuming, less expensive involving lesser manual labour and the introduction of Information Technology will bring transparency in the entire system of administration of justice. Now the application of Information Technology is extremely relevant in the Indian judicial system, but the use of technology with in the judiciary system as a whole was somewhat limited and there was a strain on the system to keep up with the advancing technology.[5] It is the duty of the judiciary to take advantage of the new opportunities offered by the Information Technology to offer a professionally excellent service to the community so now actually the Indian judiciary is pressurized to keep pace with the technology.

The extent to which Information Technology is used in judiciary can be looked from two angles. One is the use of Information Technology to improve the present paper based system by bringing in the advantage of Information Technology to increase the speed enormously and also to bring greater transparency. Information Technology can be used in functions like filing the schedules, posting of cases, grouping of cases and so on. Information Technology can increase the speed of justice delivery system; thereby enhancing the efficiency of the system. The second aspect of the use of Information Technology in judiciary is when the computer network is used for trails of crimes in cyber space.[6]

Information Technology and The Target Stake Holders: Justice and the judiciary is the inevitable result of that civilization. But the present day society is a victim to the dilatoriness of the process of justice. People unfortunately fall victim to injustice. They suffer day after day. Major portions of the Indian people are very poor and illiterate as well. They come to the court to get justice by paying their hard-earned money. They pay to advocates law clerk's day after day and wait for justice. They pay court fees and Wakalatnama and wait for justice[7].

Information Technology needs of **Judges** are diverse. A judge would like to know the judgments in cases similar to the one he is going to take up delivered by his court or any other superior court. If the information is available in his personal computer or laptop, he can prepare himself easily before coming to the court. If such information were stored in computer, the judge would be able to get a list of precedents on the touch of a button without consulting the librarian or the books. This helps the judge to deliver judgments and orders without deviation from the established law. With the help of video recognition software, a judge can dictate a judgment to the computer which will directly convert such dictation into a readable language. This will not only minimize dependence on staff of the court but also save time. A computer placed on the table top of a judge will also help to balance the number of cases on a particular date on the touch of a button. A judge may also like to record important piece of the arguments advanced by a counsel through audio visual system this will enable the judge to remember the arguments while dictating the judgments[8].

Information Technology will be equally useful for the **legal professional**. Fresher in the legal profession will not have to strive hard to learn the intricate procedure followed by the courts in filing case. Rules of filing may be made available in the website and the new comers to the profession will be able to guide themselves with the information available in the website. After the petition is submitted in the filing counter, a lawyer does not have to wait to see the case number he may collect the case number and other details of listing by browsing any of the website of the court or the "kiosks[9]" placed inside the court premise. Cause lists of the court are made available on internet in such a way that advocates can generate their own cause list consisting of their own cases only thus avoiding them to go through hundreds of pages of the cause list to locate cases. If for any reason advocates name is not appearing in the cause list retrieval can be made through the name of either the petitioner or the respondent. It is also possible to generate and print "court-number-wise", "judge wise" cause list or the entire cause list if required[10]. An advocate will not only be able to easily access the next day's cause list on the web at the end of the day but also will be able to sort out cases where he is appearing as an advocate. When an advocate visits the court for advancing arguments he can avoid carrying huge volume of books for the purpose of citing relevant decisions in the court instead he will easily carry a drive in his pocket and argue his case by attaching it to his laptop computer whenever necessary. This will not only be of

assistance to the advocate but may change the complexion of the arguments in the court. An advocate will be able to see the order passed by the court on the website and will be able to obtain a certified copy without really applying for it and waiting for a week to ten days to receive the certified copy. Information technology will able to make it possible. In this way it is apparent that the information technology will be of immense help to an advocate.

Information Technology also helps the **court staffs** in numerous ways**.** In the filing counter court fees can be automatically calculated with the help of computer. The filing clerk will be able to calculate the time limitation of the case presented before him for registration with the help of computer installed in the filing counter. When a case is free from filing defects computer will register automatically based on the existing procedures. Information technology will not only reduce much of the work of the registry but it also will speed up the filing process for the benefit if the advocates and thus lessen the job of the registry. The computers can allocate listing of cases automatically to various courts depending on the subject category and the availability of courts on a given day. Information technology tools will generate cause lists automatically and sent it to the advocates by electronic mails or make it available on the web for providing easy access to the advocates and litigants. Thus, the court staff will be behind the screen and serve the information needs of the advocates and the litigants in a more efficient manner. Information technology can help the court staff in maintaining the mandatory records in the form of hard copies as well. It will also be able to generate the required status information of pending and disposed of cases for answering parliament/ assembly questions.

In the high court computer generates Cause list automatically in consequence manual intervention is eliminated ensuring publication of cause list in time without any irregularities strictly in chronological order. All cases having similar law points to be decided by the courts can be bunched or grouped and posted before one bench for disposal with help of information technology. This will help the courts to expedite disposal of cases. When the information is in the computer it will become simpler to recall dismissed cases when review petitions are filed. Information technology will lend a helping hand to the court staff in streamlining its day-to-day activities which is one of the intents of the court management. If all the judgments of the courts can be made available in the computer it will not only save a lot of time for judges and advocates in locating precedents but also save a lot of space in maintenance of a law library. Information technology will save a good amount of money and valuable time for everyone connected with the court management.

Information technology helps to provide legal literacy to the litigants. Only when a litigant has proper legal literacy in respect of a particular subject he will not exceed his limits, commit excesses or offences. At the same time in order to prevent excesses or commission of any offence he will behave himself in a proper and conductive circumstance as a true law abiding citizen. This crucifies significance of legal literacy[11]. In countries like USA litigants seek legal counselling in websites before ever they approach their attorney. Only on gaining a thorough understanding of their own problems and having known of certain remedies they approach their attorney only in order to select the best course of remedy suiting their own circumstances. But in India, evidence in regard to seeking legal counselling is totally looking magnificently. Such a practice is yet to begin in India and only on its inception; its behaviour and outcome could be assessed. In order to lend such assistance even a waiting litigant in a lawyer's office may be permitted to browse through an internet enabled computer and thus acquire some legal knowledge. The internet offers new, inexpensive and rapid methods to provide and enhance legal literacy[12].

Using technology facilities, litigant can find out his case details without bothering the advocates. As the court orders are available on the internet almost immediately after court hours the litigant can have access to the signed orders from their own place. It will enhance confidence in the judicial process and save a lot of time and expenses on traveling to the court to obtain copy of the order. Information and Communication Technology techniques can be used in the cases where the litigant is unable to attain the court due to his health problems also it can be used where the court on facts and circumstances do not want the witness (victim) to personally attend the court and answer. It can happen in cases where

the witness (victim) is a child a rape victim etc. If the security of the accused is in jeopardy he can also use these safe techniques[13]. The real benefit of technology would be realized when justice would be delivered with minimum requirement for the litigants to produce themselves in the courts.

Information technology would save thousands of man hours the police lose in making security arrangements for brining under trails to court and nullify the chances of escape during transit operations. More often than not, justice is delayed as under trails languishing in the jails for petty crimes are not been produced before the court on time due to the lack of adequate number of transportation vehicles and police men etc. this is one of major reasons that the cases are piled up in courts and jails are overloaded day by day. Due to the overburdening of cases, the courts are taking a lot of time for disposing the same[14]. The criminal proceedings move at a slow pace as the investigating officers in relation to the cases before the court may get transferred from the court's jurisdiction and the court may call for his presence by issuance of summons/notices to the concerned officers. The investigating officers should be present before the court on the date specified by the court, and the officers keep their work aside and they appear before the court.

Using of Information Technology techniques in the courts will make the **general public** very close to the judicial system. People have a stereo-typed view that Courts are slow, rigid and secretive. Information and Communication Technology can help us change this impression and Courts can became more efficient, fast, responsible and user friendly[15].

The E- Court would well be a sneak- peak at the future of the Indian judicial system – Available at broad band speed, transparent and transcending distance barriers[16] and it claims to be

- **Paper Less Courts:** The main focus of the e-court project is to replace paper case files with electronic case files and facilitates speedy delivery of justice. Here all records of trails past and ongoing have been digitized more precisely scanned and filed in a data base which the judge can access on a click of mouse.
  Major advantage of paperless courts is storage place is greatly reduced in an e- court. Due to the lack of storage space the clerk must purge records yearly physically sort and move lakhs of files per year to make space for the coming years new files. The expense man power and storage space problems are totally eliminated by use of electronic records[17].

- **Audio- Visual Presentation Facility:** At present the Advocates tender their Oral Arguments before the Judges. For these arguments, their preparations are based on the documents, copy of citations, books containing the citations, knowledge and experience of the Advocates. The judge listens to these arguments and wherever needed, he makes a note in writing. Many arguments may be quite lengthy. Some may involve complex matters of the present society. In such cases, humanly it may not be possible for the judge to remember and recall complete arguments accurately. In the E- courts the advocates will get audio- visual presentation facility means the advocates can use audio- visual aids to improve and simplify his presentation of arguments. In prehistoric days, the arguments were only oral. Subsequently written arguments were being submitted. Here the advocate will prepare his arguments on modern system of presentation like PowerPoint Presentation in which various points of arguments will be contained in slides with narration. These points will have links to extracts from legal books, citations and documents which will also be displayed on screen when needed.

  The said 'Video Arguments' is recorded in a CD with a label giving the details of the case, parties etc. The said CD as a document is just like a 'Written Arguments'. A CD can contain information of nearly 1 lakh pages and occupies very small space only. Thus the proposed data storage is not only considerably cheaper than the present system but so easy to carry and store in court records. The search and recall of the information is quite easy. The arguing Advocate will carry the said CDs and his laptop to the Court Room. The judge will also have a monitor which may be connected to his laptop. He will play the CD, may pause and explain if needed. In actual case, two copies of the said CD will be given to the Court, one for the Court and another for the opposite party. If the Judge does

not have time to view and listen to whole arguments, he may view the CD at the time of writing the judgment. The biggest advantage is 100% record and 100% recall of the arguments with facility of pause, forward, backward and replay whenever required during writing of the judgment.

- **Video- Conferencing Facility:** In each e-court there will be a video conferencing system with two cameras one facing the judges and the other facing the advocates. There will be two plasma screens in the court which can be viewed by the judges and the advocates. There will also be a document camera for projecting paper documents on the plasma screens a good public addressing system with wireless microphones TV sets DVD recorder for recording the video conferencing proceedings and a computer system with internet connectivity. This video conferencing system will be connected to a remote video conference system installed either within or outside the country. As the video conference facility is easy to operate with little training to the court staff it can be operated by them without any difficulty.

- **E- Advocacy:** The information technology based advocacy enables the advocates to explain their point of view more clearly to the judges with the help of multi-media presentations in the court rooms. This process will help the judges in following the arguments put forward by the advocates more easily. With the introduction of the IT- advocacy while arguing a case an advocate can either include a reference to the precedents in his or her IT based presentation or by assessing internet he/she can get it displayed on the large screen installed in the court. The IT based tools will provide a better way of presenting complex cases involving voluminous documents which are often difficult to manage and present.

- **E- Filing of the Cases:** The concept of e-filing envisages filing of cases in the court by the advocates sitting at his or her office or home. The essential format in which the advocates need to file his or her case will be pre-defined for eliminating any possible filing defects. The person electronically filing a case will also get a receipt with the digital signature of the court authority. E- Filing should be mandatory for all cases coming before the e-courts[18].

- **E- Stamping:** Judicial stamps are used for payment of court fees on suits filed in courts. E- Stamping is a computer based application and a secured electronic way of stamping documents. The prevailing system of physical stamp paper is being replaced by E- Stamping system. It is a web based application for paying court fees on the suits filed in courts. In simple terms it means electronic purchase of judicial stamps and electronic mode of court fees payment.

- **Facilitation Centre:** When the courts become fully networked the information that has public relevance can be provided at any centralized place with in the court complex. For this purpose a facilitation centre for the benefit of the litigants and the advocates can be created.

In the facilitation centre there will be three- four information kiosks with touch screen facility connected to high courts network. These computer systems will have soft touch key display keyboards without attached keyboards so as to avoid mishandling and pilferage of computer peripherals. Some of the facilities available at the facilitation centre will also be made available on internet for the benefit of a wide range of users[19].

Advantages of E Court: E- Court is a great effort for achieving SMART[20] judiciary system in India[21]. Its notable benefits are

- Efficient court management.
- Digitalization of documents.
- Speedy disposal of cases.
- Internet aids are available for citations and research.
- E- Mail based communication facility.
- Congenial and comfortable atmosphere increases efficiency.

Today we are living in the age of electronic revolution. Now our methodologies in the courts are outdated and they need a re-look with innovation. We can hope that electronic courts will provide congenial and comfortable atmosphere to our present outdated court system and judiciary and it will increases the efficiency of our court system and judiciary.

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A COMPARATIVE STUDY ON CONSUMER PROTECTION ACT OF 2019 AND 1986

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Abstract: *Consumer* refers to any person who purchases some goods for a consideration that has been either paid or promised to pay or partly paid and partly promised.
The consumer protection Act 2019 provides for the protection of interest of consumers and to establish authority for timely and effective administration and settlement of consumer disputes. The Act has been enacted by the parliament in the 70th year of republic of India and received the assent of the President on 9th August 2019 thereby repealing the Consumer Protection Act 1986.In the modern era of marketing where consumer sovereignty exists this Act plays a significant role. The various lacunae created by the provisions of Consumer Protection Act 1986 stipulated the need for redesigning and forming a new Act with more strict and stringent rules which finally led to the Consumer Protection Act 2019. In this paper we will be making a comparative study on the provisions of Consumer Protection Act 2019 and Consumer Protection Act 1986. The paper will also highlight the role played by different consumer protection councils in dealing with the issues of consumer.

Keywords: Consumer, Protection, Councils.

Introduction: "A customer is the most important visitor on our premises. He is not dependent on us. We are dependent on him. He is not an interruption in our work. He is the purpose of it. He is not an outsider in our business. He is part of it. We are not doing him a favour by serving him. He is doing us a favour by giving us an opportunity to do so" - Mahatma Gandhi.

The existence of a business is solely dependent on the consumers. They are the in the forefront in all aspects business. Consumer Sovereignty is the lime light in this era of globalization. The key motivation for the production units to run smoothly are the demand for the consumers. The consumer is an individual who pay for buying goods and availing services. They play an important role in the chain of distribution.

Consumer refers to any person who purchases some goods for a consideration that has been either paid or promised to pay or partly paid and partly promised.

To protect the interests of consumers in 1986 the landmark legislation of Consumer Protection Act was enforced from 1986. It provides all round protection to consumers and safeguards against various types of exploitation. The act ensures simple speedy and inexpensive machinery for redressal of consumer grievances at district, state and national level. The agencies had jurisdiction to adjudicate the complaints received from consumers against any defect in the goods purchased or deficiencies in the services availed or any other trade practices. The Act is applicable to all goods, services and unfair trade practices unless exempted by the Central Government under all sectors-Private, Public or Co-Operative.

Consumer Protection Act 2019 replaced the Consumer Protection Act 1986 and aims at protecting at strengthening the rights of consumers by establishing authority imposing strict liabilities and penalties on product manufacturers, electronic service providers, misleading advertisers, and by providing additional settlement of consumer disputes through mediation

The following are the major findings

Consumer: Section 2(1)(d) of CP Act, 1986 "Consumer means any person who buys or avails of any service for a consideration which has been paid or promised or partly paid and partly promised under any system of deferred payment etc"

Section 2(7) explanation (b) of the Consumer Protection Act, 2019

"consumer" is defined as a person who "buys any goods" and "hires or avails of any service" for consideration but does not include a person who obtains goods for resale or goods or service for any commercial purpose.

Product Liability: As per Section.2(34) of Consumer Protection Act, 2019 The concept of "product liability" is defined is as the responsibility of a product manufacturer or product seller of any product or service to compensate for any harm caused to a consumer due to defective product manufactured, sold or deficiency in services relating thereto.

"**E-commerce" and "Electronic Service Provider":** As per Section 2(16) E Commerce means buying or selling of goods or services including digital products over digital or electronic network. The Central Government in accordance with the Act prescribes rules for preventing unfair trade practices in E Commerce and direct selling. Section 94 of the Act refers to the prevention of unfair trade practices in e-commerce and direct selling and also deals with protection of interest and rights of consumers.

As per the provisions of the Act an Electronic Service Provider refers to any individual who provides technology or processes to enable a seller in engaging of advertising or selling goods or services to a consumer and includes any online marketplace or online auction sites. Inclusion of these provisions broadened the scope of the Act rights of the e-consumers and also enables them to proceed against the e-commerce websites in the event of any infringement or violation.

Central Consumer Protection Authority (CCPA): The Act introduces the establishment of a Central Consumer Protection Authority (CCPA) by the central government. as a regulatory authority and shall be empowered to impose penalties, recall goods, cause withdrawal of services, provide refunds and investigate into matters. It shall also be responsible for protecting the rights of consumers as a class and shall further ensure that no person engages in unfair trade practices and that no misleading advertisements are made. The Act provides for establishing an investigation wing which shall be headed by the director general who shall be appointed by the central government for conducting investigations as per the order of the CCPA. Further, the Act also introduces electronic mode for filing complaint for unfair trade practices or false or misleading advertisements to the district collector, the commissioner of the regional office or the CCPA

Consumer Dispute Redressal Commission: The Act provides for setting up of a Consumer Dispute Redressal Commission (CDRC), which shall be set up at the district, state and national level (Commissions). The CDRC is empowered to resolve complaints with respect to unfair and restrictive trade practices, defective goods and services, overcharging and goods which are a hazardous to life and safety.

The pecuniary jurisdiction of the Commissions has been enhanced in comparison with the Consumer Protection Act, 1986. The district commission now has the jurisdiction to entertain complaints where the value of the goods or services paid as consideration (Consideration) does not exceed INR1 crore.

The state commission shall have the jurisdiction to entertain complaints where the Consideration exceeds INR1 crore but does not exceed INR10 crores and the national commission shall have the jurisdiction to entertain complaints where the Consideration paid exceeds INR10 crores. The jurisdiction in which the complaint is to be filed is now based on the value of the goods or services paid unlike in the earlier Act, where it was on value of the goods or services and the compensation, if any, claimed.

Further, the Act has inserted a crucial aspect with respect to the jurisdiction of the district commission, i.e., Section 34(2)(d). This section categorically states that the complaint can now also be instituted in a district commission within the local limits of whose jurisdiction the complainant resides or personally works for gain, apart from filing in the jurisdiction where the other side actually or voluntarily resides, or carries on business, or has a branch office or personally works for gain.

Mediation: The Act has introduced a new chapter on mediation as an alternate dispute resolution mechanism, in order to resolve the consumer dispute faster without having to approach the Commissions. The dispute can be resolved either in whole or in parts.

Thus, in the event, the mediation is successful, the terms of such agreement shall be reduced into writing accordingly. Where the consumer dispute is settled only in part, the Commission, shall record the settlement of the issues which have been settled, and shall continue to hear the remaining issues involved in the dispute. In the event the mediation is not successful, the respective commission shall within seven days of the receipt of the settlement report, pass a suitable order and dispose the matter accordingly.

Offences and Penalties: The Act has introduced a separate set of penalties with respect to misleading advertisements, ranging from INR10 lakhs with an imprisonment for up to two years to INR50 lakhs) with an imprisonment for up to five years. Any failure to comply with the directions of the CCPA for recall of goods, withdrawal of services shall attract an imprisonment for a term which may extend to six months or with a fine which may extend to INR20 lakhs.

On the basis of comparison of both the enactments we can say that the Consumer Protection Act of 2019 is the need of the time.

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E JUDICIARY SYSTEM ACCESSING JUSTICE IN A VIRTUAL WORLD

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E JUDICIARY SYSTEM – ACCESSING JUSTICE IN A VIRTUAL WORLD

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Abstract: In today's parlance Information Technology or IT is synonymous with computers or the usage of computers for any ends. Information Technology is the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information by a micro-electronics based combination of computing and telecommunications. It is an umbrella term that includes any communication device or application, radio, television, cellular phones, wireless networks, computer and network hardware and software satellite systems and so on as well as the various services and applications associated with them such as video conferencing and electronic mail. The advent of Information Technology has necessitated many organizations to re-look in to their business process. The world around has significantly drifted in the flow of technology driven by internet and Information Technology. The courts are not an exception to ignore the ever-changing technological developments. Information Technology has found its way in to legal practice and as a part there of to the judiciary. With the help of Information Technology, the process of dispensation of justice has been made easier, more convenient, accurate, less time consuming and less expensive involving lesser manual labour. The introduction of Information Technology on a permanent basis will bring transparency in the entire system of administration of justice. The Indian Judiciary is in urgent need of re-engineering its processes by optimizes the use of its human resources and brings about change management by harnessing the potentiality of the available Information and Communication Technology (ICT) to its fullest extent. enhance judicial productivity both qualitatively and quantitatively as also to make the justice delivery system affordable, accessible, cost effective, transparent and accountable.

Keywords: E Judiciary, Information Technology, ICT, Virtual World.

Introduction: Information Technology is the acquisition, processing, storage and dissemination of vocal pictorial, textual and numerical information by a microelectronics based combination of computing and telecommunications.[1] It is an umbrella term that includes any communication device or application, radio, television, cellular phones, wireless networks, computer and network hardware and software satellite systems and so on as well as the various services and applications associated with them such as video conferencing electronic mail etc.

Technological developments in the field of information and introduction of computer have made a turning point in the history of human civilization. It has brought about a sea change in all fields of human activity. It has resulted in enhanced efficiency, productivity and quality of output in every walk of life. Extensive use of Information Technology by diverse organizations over the world has resulted in enhanced efficiency, effectiveness and optimal use of resources.[2] Computers as well as electronic communication devices such as facsimile machines[3] electronic mail, video conferencing, provide the ability to process large volumes of data with speed and accuracy exchange of useful information between different locations and support higher quality of decision making.[4]

The advent of Information Technology has necessitated many organizations to re-look in to their business process. The courts are not an exception to ignore the ever-changing technological

developments. It has been established beyond doubt that with the help of Information Technology the process of dispensation of justice can be made easier, more convenient, accurate, less time consuming, less expensive involving lesser manual labour and the introduction of Information Technology will bring transparency in the entire system of administration of justice. Now the application of Information Technology is extremely relevant in the Indian judicial system, but the use of technology with in the judiciary system as a whole was somewhat limited and there was a strain on the system to keep up with the advancing technology.[5] It is the duty of the judiciary to take advantage of the new opportunities offered by the Information Technology to offer a professionally excellent service to the community so now actually the Indian judiciary is pressurized to keep pace with the technology.

The extent to which Information Technology is used in judiciary can be looked from two angles. One is the use of Information Technology to improve the present paper based system by bringing in the advantage of Information Technology to increase the speed enormously and also to bring greater transparency. Information Technology can be used in functions like filing the schedules, posting of cases, grouping of cases and so on. Information Technology can increase the speed of justice delivery system; thereby enhancing the efficiency of the system. The second aspect of the use of Information Technology in judiciary is when the computer network is used for trails of crimes in cyber space.[6]

Information Technology and The Target Stake Holders: Justice and the judiciary is the inevitable result of that civilization. But the present day society is a victim to the dilatoriness of the process of justice. People unfortunately fall victim to injustice. They suffer day after day. Major portions of the Indian people are very poor and illiterate as well. They come to the court to get justice by paying their hard-earned money. They pay to advocates law clerk's day after day and wait for justice. They pay court fees and Wakalatnama and wait for justice[7].

Information Technology needs of **Judges** are diverse. A judge would like to know the judgments in cases similar to the one he is going to take up delivered by his court or any other superior court. If the information is available in his personal computer or laptop, he can prepare himself easily before coming to the court. If such information were stored in computer, the judge would be able to get a list of precedents on the touch of a button without consulting the librarian or the books. This helps the judge to deliver judgments and orders without deviation from the established law. With the help of video recognition software, a judge can dictate a judgment to the computer which will directly convert such dictation into a readable language. This will not only minimize dependence on staff of the court but also save time. A computer placed on the table top of a judge will also help to balance the number of cases on a particular date on the touch of a button. A judge may also like to record important piece of the arguments advanced by a counsel through audio visual system this will enable the judge to remember the arguments while dictating the judgments[8].

Information Technology will be equally useful for the **legal professional**. Fresher in the legal profession will not have to strive hard to learn the intricate procedure followed by the courts in filing case. Rules of filing may be made available in the website and the new comers to the profession will be able to guide themselves with the information available in the website. After the petition is submitted in the filing counter, a lawyer does not have to wait to see the case number he may collect the case number and other details of listing by browsing any of the website of the court or the "kiosks[9]" placed inside the court premise. Cause lists of the court are made available on internet in such a way that advocates can generate their own cause list consisting of their own cases only thus avoiding them to go through hundreds of pages of the cause list to locate cases. If for any reason advocates name is not appearing in the cause list retrieval can be made through the name of either the petitioner or the respondent. It is also possible to generate and print "court-number-wise", "judge wise" cause list or the entire cause list if required[10]. An advocate will not only be able to easily access the next day's cause list on the web at the end of the day but also will be able to sort out cases where he is appearing as an advocate. When an advocate visits the court for advancing arguments he can avoid carrying huge volume of books for the purpose of citing relevant decisions in the court instead he will easily carry a drive in his pocket and argue his case by attaching it to his laptop computer whenever necessary. This will not only be of

assistance to the advocate but may change the complexion of the arguments in the court. An advocate will be able to see the order passed by the court on the website and will be able to obtain a certified copy without really applying for it and waiting for a week to ten days to receive the certified copy. Information technology will able to make it possible. In this way it is apparent that the information technology will be of immense help to an advocate.

Information Technology also helps the **court staffs** in numerous ways**.** In the filing counter court fees can be automatically calculated with the help of computer. The filing clerk will be able to calculate the time limitation of the case presented before him for registration with the help of computer installed in the filing counter. When a case is free from filing defects computer will register automatically based on the existing procedures. Information technology will not only reduce much of the work of the registry but it also will speed up the filing process for the benefit if the advocates and thus lessen the job of the registry. The computers can allocate listing of cases automatically to various courts depending on the subject category and the availability of courts on a given day. Information technology tools will generate cause lists automatically and sent it to the advocates by electronic mails or make it available on the web for providing easy access to the advocates and litigants. Thus, the court staff will be behind the screen and serve the information needs of the advocates and the litigants in a more efficient manner. Information technology can help the court staff in maintaining the mandatory records in the form of hard copies as well. It will also be able to generate the required status information of pending and disposed of cases for answering parliament/ assembly questions.

In the high court computer generates Cause list automatically in consequence manual intervention is eliminated ensuring publication of cause list in time without any irregularities strictly in chronological order. All cases having similar law points to be decided by the courts can be bunched or grouped and posted before one bench for disposal with help of information technology. This will help the courts to expedite disposal of cases. When the information is in the computer it will become simpler to recall dismissed cases when review petitions are filed. Information technology will lend a helping hand to the court staff in streamlining its day-to-day activities which is one of the intents of the court management. If all the judgments of the courts can be made available in the computer it will not only save a lot of time for judges and advocates in locating precedents but also save a lot of space in maintenance of a law library. Information technology will save a good amount of money and valuable time for everyone connected with the court management.

Information technology helps to provide legal literacy to the litigants. Only when a litigant has proper legal literacy in respect of a particular subject he will not exceed his limits, commit excesses or offences. At the same time in order to prevent excesses or commission of any offence he will behave himself in a proper and conductive circumstance as a true law abiding citizen. This crucifies significance of legal literacy[11]. In countries like USA litigants seek legal counselling in websites before ever they approach their attorney. Only on gaining a thorough understanding of their own problems and having known of certain remedies they approach their attorney only in order to select the best course of remedy suiting their own circumstances. But in India, evidence in regard to seeking legal counselling is totally looking magnificently. Such a practice is yet to begin in India and only on its inception; its behaviour and outcome could be assessed. In order to lend such assistance even a waiting litigant in a lawyer's office may be permitted to browse through an internet enabled computer and thus acquire some legal knowledge. The internet offers new, inexpensive and rapid methods to provide and enhance legal literacy[12].

Using technology facilities, litigant can find out his case details without bothering the advocates. As the court orders are available on the internet almost immediately after court hours the litigant can have access to the signed orders from their own place. It will enhance confidence in the judicial process and save a lot of time and expenses on traveling to the court to obtain copy of the order. Information and Communication Technology techniques can be used in the cases where the litigant is unable to attain the court due to his health problems also it can be used where the court on facts and circumstances do not want the witness (victim) to personally attend the court and answer. It can happen in cases where

the witness (victim) is a child a rape victim etc. If the security of the accused is in jeopardy he can also use these safe techniques[13]. The real benefit of technology would be realized when justice would be delivered with minimum requirement for the litigants to produce themselves in the courts.

Information technology would save thousands of man hours the police lose in making security arrangements for brining under trails to court and nullify the chances of escape during transit operations. More often than not, justice is delayed as under trails languishing in the jails for petty crimes are not been produced before the court on time due to the lack of adequate number of transportation vehicles and police men etc. this is one of major reasons that the cases are piled up in courts and jails are overloaded day by day. Due to the overburdening of cases, the courts are taking a lot of time for disposing the same[14]. The criminal proceedings move at a slow pace as the investigating officers in relation to the cases before the court may get transferred from the court's jurisdiction and the court may call for his presence by issuance of summons/notices to the concerned officers. The investigating officers should be present before the court on the date specified by the court, and the officers keep their work aside and they appear before the court.

Using of Information Technology techniques in the courts will make the **general public** very close to the judicial system. People have a stereo-typed view that Courts are slow, rigid and secretive. Information and Communication Technology can help us change this impression and Courts can became more efficient, fast, responsible and user friendly[15].

The E- Court would well be a sneak- peak at the future of the Indian judicial system – Available at broad band speed, transparent and transcending distance barriers[16] and it claims to be

- **Paper Less Courts:** The main focus of the e-court project is to replace paper case files with electronic case files and facilitates speedy delivery of justice. Here all records of trails past and ongoing have been digitized more precisely scanned and filed in a data base which the judge can access on a click of mouse.
  Major advantage of paperless courts is storage place is greatly reduced in an e- court. Due to the lack of storage space the clerk must purge records yearly physically sort and move lakhs of files per year to make space for the coming years new files. The expense man power and storage space problems are totally eliminated by use of electronic records[17].

- **Audio- Visual Presentation Facility:** At present the Advocates tender their Oral Arguments before the Judges. For these arguments, their preparations are based on the documents, copy of citations, books containing the citations, knowledge and experience of the Advocates. The judge listens to these arguments and wherever needed, he makes a note in writing. Many arguments may be quite lengthy. Some may involve complex matters of the present society. In such cases, humanly it may not be possible for the judge to remember and recall complete arguments accurately. In the E- courts the advocates will get audio- visual presentation facility means the advocates can use audio- visual aids to improve and simplify his presentation of arguments. In prehistoric days, the arguments were only oral. Subsequently written arguments were being submitted. Here the advocate will prepare his arguments on modern system of presentation like PowerPoint Presentation in which various points of arguments will be contained in slides with narration. These points will have links to extracts from legal books, citations and documents which will also be displayed on screen when needed.

  The said 'Video Arguments' is recorded in a CD with a label giving the details of the case, parties etc. The said CD as a document is just like a 'Written Arguments'. A CD can contain information of nearly 1 lakh pages and occupies very small space only. Thus the proposed data storage is not only considerably cheaper than the present system but so easy to carry and store in court records. The search and recall of the information is quite easy. The arguing Advocate will carry the said CDs and his laptop to the Court Room. The judge will also have a monitor which may be connected to his laptop. He will play the CD, may pause and explain if needed. In actual case, two copies of the said CD will be given to the Court, one for the Court and another for the opposite party. If the Judge does

not have time to view and listen to whole arguments, he may view the CD at the time of writing the judgment. The biggest advantage is 100% record and 100% recall of the arguments with facility of pause, forward, backward and replay whenever required during writing of the judgment.

- **Video- Conferencing Facility:** In each e-court there will be a video conferencing system with two cameras one facing the judges and the other facing the advocates. There will be two plasma screens in the court which can be viewed by the judges and the advocates. There will also be a document camera for projecting paper documents on the plasma screens a good public addressing system with wireless microphones TV sets DVD recorder for recording the video conferencing proceedings and a computer system with internet connectivity. This video conferencing system will be connected to a remote video conference system installed either within or outside the country. As the video conference facility is easy to operate with little training to the court staff it can be operated by them without any difficulty.

- **E- Advocacy:** The information technology based advocacy enables the advocates to explain their point of view more clearly to the judges with the help of multi-media presentations in the court rooms. This process will help the judges in following the arguments put forward by the advocates more easily. With the introduction of the IT- advocacy while arguing a case an advocate can either include a reference to the precedents in his or her IT based presentation or by assessing internet he/she can get it displayed on the large screen installed in the court. The IT based tools will provide a better way of presenting complex cases involving voluminous documents which are often difficult to manage and present.

- **E- Filing of the Cases:** The concept of e-filing envisages filing of cases in the court by the advocates sitting at his or her office or home. The essential format in which the advocates need to file his or her case will be pre-defined for eliminating any possible filing defects. The person electronically filing a case will also get a receipt with the digital signature of the court authority. E- Filing should be mandatory for all cases coming before the e-courts[18].

- **E- Stamping:** Judicial stamps are used for payment of court fees on suits filed in courts. E- Stamping is a computer based application and a secured electronic way of stamping documents. The prevailing system of physical stamp paper is being replaced by E- Stamping system. It is a web based application for paying court fees on the suits filed in courts. In simple terms it means electronic purchase of judicial stamps and electronic mode of court fees payment.

- **Facilitation Centre:** When the courts become fully networked the information that has public relevance can be provided at any centralized place with in the court complex. For this purpose a facilitation centre for the benefit of the litigants and the advocates can be created.

In the facilitation centre there will be three- four information kiosks with touch screen facility connected to high courts network. These computer systems will have soft touch key display keyboards without attached keyboards so as to avoid mishandling and pilferage of computer peripherals. Some of the facilities available at the facilitation centre will also be made available on internet for the benefit of a wide range of users[19].

Advantages of E Court: E- Court is a great effort for achieving SMART[20] judiciary system in India[21]. Its notable benefits are

- Efficient court management.
- Digitalization of documents.
- Speedy disposal of cases.
- Internet aids are available for citations and research.
- E- Mail based communication facility.
- Congenial and comfortable atmosphere increases efficiency.

Today we are living in the age of electronic revolution. Now our methodologies in the courts are outdated and they need a re-look with innovation. We can hope that electronic courts will provide congenial and comfortable atmosphere to our present outdated court system and judiciary and it will increases the efficiency of our court system and judiciary.

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Customer's Preference Between Third Party UPI Apps and Banking Apps

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Abstract

This case deals with the customer's preference between 3rd Party UPI applications and Banking applications. This is a fictitious case that deals with the problems faced by customers in using banking app and 3rd party apps. The case revolves around two friends who were working in different firms and were discussing the issues related with the payment platforms. The case first talks about the banking applications, UPI apps and its benefits. The case is in the form of a conversation mode and thereafter a survey has been conducted among customers. The case requires students to practically apply the digital banking concepts in real life situations. It is designed in such a way that the students will be able to apply the relevant banking concepts to solve the issue.

Keywords: Unified Payment Interface, Digital banking, Payment gateways, Banking applications, Third Party UPI
JEL Codes: E42, E44, G21, O16

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Mr. Sam Thomas and Ms. Annie Grace were friends from college. Mr. Sam was working as a Digital Banking Ambassador in a Nationalized bank and Ms. Annie was working as Digital Marketing Manager in Third party UPI Application in India Mobile Pay (M-Pay). In a causal phone conversation Ms. Annie mentioned various issues faced by the customers and henceforth causing reduction in the quantum of satisfied customers. She also added that her maid who was a migrant from North East part of India to the Urban city, where able to send money frequently to the home with the help of 3rd party UPI applications. People who are not so expert with the technology, use these applications for seamless fund transfers. A report by Accenture stated, "About 66.6 billion transactions worth USD 270.7 billion are expected to shift from Cash to Cards and Digital Payments by 2023 in India, and further increase to USD 856.6 billion by 2030".

After this conservation, Sam was perplexed whether his customers are satisfied or not. Thinking further he was so confused in a way that he wants to study the actual reasons of reduction in customers and also, he wants to understand the factors which customers preferred 3rd party UPI applications than banking apps.

In the same evening Mr. Sam arranged a meeting with his team and assigned team members to explore the fact findings of customer's preference between Banking app and 3rd Party UPI applications.

After a week's time the team members submitted a detailed report after conducting a research and highlights given as below from primary and secondary sources.

Exhibit I: UPI Product Statistics

Month	No. of Banks live on UPI	Volume (in Mn)	Amount (Rs. in Cr.)
20-May	155	1,234.50	218,391.60
20-Apr	153	999.57	151,140.66
20-Mar	148	1,246.84	206,462.31
20-Feb	146	1,325.69	222,516.95
20-Jan	144	1,305.02	216,242.97
19-Dec	143	1,308.40	202,520.76
19-Nov	143	1,218.77	189,229.09
19-Oct	141	1,148.36	191,359.94
19-Sep	141	955.02	161,456.56
19-Aug	141	918.35	154,504.89
19-Jul	143	822.29	146,386.64
19-Jun	142	754.54	146,566.35
19-May	143	733.54	152,449.29
19-Apr	144	781.79	142,034.39
19-Mar	142	799.54	133,460.72
19-Feb	139	674.19	106,737.12
19-Jan	134	672.75	109,932.43
18-Dec	129	620.17	102,594.82
18-Nov	128	524.94	82,232.21
18-Oct	128	482.36	74,978.27
18-Sep	122	405.87	59,835.36
18-Aug	114	312.02	54,212.26
18-Jul	114	273.75	51,843.14
18-Jun	110	246.37	40,834.03
18-May	101	189.48	33,288.51
18-Apr	97	190.08	27,021.85

18-Mar	91	178.05	24,172.60
18-Feb	86	171.4	19,126.20
18-Jan	71	151.83	15,571.20
17-Dec	67	145.64	13,174.24
17-Nov	61	105.02	9,669.33
17-Oct	60	76.96	7057.78
17-Sep	57	30.98	5,325.81
17-Aug	55	16.8	4,156.62
17-Jul	53	11.63	3,411.35
17-Jun	52	10.35	3,098.36
17-May	49	9.36	2,797.07
17-Apr	48	7.2	2,271.24
17-Mar	44	6.37	2,425.14
17-Feb	44	4.38	1,937.71
17-Jan	36	4.46	1,696.22

Source: https://www.npci.org.in/product-statistics/upi-product-statistics

The above UPI statistics shows a clear indication to the growth of Single Application for accessing multiple bank accounts for seamless fund transfer over a period ranging from Jan.2017 to May 2020. From 36 banks it has been increased to 155 banks live on the Unified Payment System across the country. It shows the increasing trend of digitally enabled banking system.

Exhibit II: Statistics of Banking App- *i Bank*

Particulars		**No. of Respondents from an urban city**	**Percentage**
Usage statistics	Daily	75	15%
	Weekly	84	16.80%
	Monthly	220	44%
	Never	121	24.20%
	Total	**500**	**100.00%**
Factor restricting the use of banking app	Unavailability of Mobile	10	2%
	Lack of Connectivity	23	4.60%
	Low transaction easiness	370	74.00%
	Fear of Security Issues	97	19.4%
	Total	**500**	**100.00%**

Source: Primary

Exhibit III: Third Party UPI applications in India

Particulars		**No. Of Respondents from an urban city**	**Percentage**
Usage of Third-Party UPI Apps	Yes	285	57%
	No	215	43%
	Total	**500**	**100%**
Usage statistics of Third-party UPI Apps	Daily	66	23%
	Weekly	172	60%
	Monthly	47	17%

	Total	**285**	**100.00%**
Security concerns of Third-Party UPI Apps	Yes	215	75.40%
	No	70	24.60%
	Total	**285**	**100**

Source: Primary

Exhibit IV: Reason for using third party UPI apps.

SL. No.	**Particulars**	**No. Of Respondents**	**Percentage**
1	Easy to Activate	112	39.3%
2	Features	77	27.02%
3	Cash Backs and Rewards	94	32.98%
4	Advertisement	2	0.70%
	TOTAL	**285**	**100**

Source: Primary data

Table 3 exhibited the data which has been collected through online questionnaire from a sample size of 500 bank customers in an urban city. 57% of the respondents uses various 3rd party UPI applications for payment services. 60% of the users uses these applications on a weekly basis and 75% responded that they were concern about the security issues in these applications. From Table No.4 we can infer that the prime reason for choosing these 3rd party applications was the feature offered by those companies, followed by the ease of activation procedures by these applications.

After thorough analysis of the above report Mr. Sam Thomas called his friend Ms. Annie Grace:

Thomas: Hi Grace, Last week you had mentioned about the customers preference between banking applications and 3rd Party UPI apps. Out of curiosity, my team in the bank made an informal study from taking online survey from our customers.
Grace: Oh, Really! That's so interesting. Would you mind sharing me the conclusions drawn after the study.
Thomas: Actually, we published that in our report and its available in our website. But I would like to share with you few inferences we made from the study:

1. The customers were using more of the banking app provided by the bank as compared to that of the third-party UPI app. 66.4% of respondents were using banking app whereas only 57% respondents were using third party UPI apps. This shows that the banking app are more demanded among the customers.
2. More than 3/4th of the respondents was highly satisfied with the services provided by bank. This is a positive indication for the bank.
3. The biggest factor for not using the banking app by the customers were due to the fear of security issues the customer has about the banking app.
4. The withdrawal of reward system by the third-party UPI app would not create a huge problem for the third-party UPI app.
5. The third-party UPI were mostly used weekly by the customer and the banking app was mostly used by the customers on a weekly basis.
6. Fund transfer is found to be the most useful part for the customers from the banking apps perspective.

Grace: This is like an eye opener for me also. Thank you, Sam.
Thomas: You are welcome Annie and thanks for the idea which probed us to explore this area.

Conclusion

From the above case it was evident that banking applications were widely used by customers as they considered it as more secure than 3rd party UPI applications. So banks need to give emphasis on cyber- security and 2 factor authentications.

Story line

The Companies Background

Nationalized Bank Profile: It is an Indian Private Bank operating in India and has representative offices at GCC. It has a customer base of 10 million and has 1251 branches across different states in India. Its financial shows a Total Revenue US $2.1 billion, Operating Income US $220 million, Total assets US$ 25 Billion as per Q1 2020.
The Bank is a pioneer among traditional banks in India in the area of using technology to leverage its operations and was among the first banks in India to computerize all its branches. It offers wide range of services of services such as Internet banking, Mobile banking, on-line bill payment, online fees collection, Depository services, Cash Management Services, Merchant banking services, insurance, mutual fund products and many more. During the year of 2016 Bank launched its mobile application for its customers by offering seamless and secure financial transactions through its single Mobile application – "i Bank" (fictional name).

i Bank services

Funds transfer	Mini Statement & Bill Payments	Deposits & Loans & Investment
•Transfer funds to own accounts & other Bank accounts •Quick pay (transfer funds without adding payee) •Fund transfer (Add payee and transfer funds) •IMPS/NEFT/ UPI Services •Scan N Pay •Schedule payments •Set transaction limits **•Other services** •Request cheque book •Register/Deregister 15G/H •Shop on chat •App available in 5 languages (English, Hindi, Malayalam, Tamil & Guajarati)	•List of transactions •Account Summary **•Bill Payments** •Mobile/DTH/Data Card Recharge •School Fee Payment •Utility Bill Payment (Electricity, Gas, Water, Insurance, Telecom, Landline Telephone, Broadband Postpaid, Mobile Postpaid bills) •Bookings •Hotel Bookings •Bus bookings •Event bookings •Movie Bookings	•Open new Term Deposits (Fixed Deposit/ Recurring Deposit/ Tax Saving Deposits) •Avail Loan against Deposit •Close Term Deposit/ Loan against Deposits •Avail Personal loan **•Investment** •Mutual Funds •Insurance •Manage Debit Cards •Enable /Disable cards •Block debit cards

Exhibit V: iBank

In April 2016, NPCI launched a pilot programme of UPI with 21 banks that went live. As of April 2018, there are 95 banks on board the UPI system. NPCI says that UPI caters to the peer-to-peer payments in particular and offers a unique proposition in form of availability of all bank accounts through a single app.

UPI

Unified Payments Interface (UPI) is an instant real-time payment system developed by National Payments Corporation of India facilitating inter-bank transactions. The interface is regulated by the Reserve Bank of India and works by instantly transferring funds between two bank accounts on a mobile platform. As of March 2019, there are 142 banks live on UPI with a monthly volume of 799.54 million transactions and a value of ₹1.334 trillion (US$19 billion). UPI witnessed 1,029.44 crore transactions until August 2019. The mobile-only payment system helped transact a total of ₹17.29 lakh crore (US$240 billion) during the 37 months of operation starting from 2016.

Exhibit VI: Third party UPI companies in India

Sr. No.	TPAP / Merchant Name	PSP / Acquiring Bank	Sr. No.	TPAP / Merchant Name	PSP / Acquiring Bank
1	Amazon Pay	Axis Bank	11	Mi Pay	ICICI Bank
2	Bajaj Finserv Direct Ltd	Axis Bank	12	MobiKwik	HDFC Bank
3	CoinTab	Federal Bank	13	MudraPay	Yes Bank
4	Cred	Axis Bank	14	Omegaon	Yes Bank
5	My FAStag	Indus Ind Bank	15	PayBee	IDFC Bank
6	Angel Broking	Yes Bank	16	Phonepe	Yes Bank
7	Google Pay	Axis Bank	17	RealmePaySa	HDFC Bank
		HDFC Bank	18	Samsung Pay	Axis Bank
		ICICI	19	TrueCaller	ICICI
		State Bank of India			Bank of Baroda
8	Just Dial	HDFC Bank	20	Uber India	Axis Bank
9	Khalijeb	Kotak Mahindra Bank	21	Ultracash	IDFC Bank
10	Make My Trip	ICICI	22	# WhatsApp (Live for Limited users)	ICICI Bank

Source: https://www.npci.org.in/upi-PSP%263rdpartyApps

Mobile Pay (M-pay) is a digital wallet platform and online payment which currently available in 10 Indian Languages. It offers online use-cases like mobile recharges, utility bill payments, travel, movies, and events bookings as well as in-store payments at grocery stores, fruits and vegetable shops, restaurants, parking, tolls, pharmacies and educational institutions with the QR code.

Utility bill payments	Travel	Recharge	Miscellaneous movies	Pay Insurance Premium
•Electricity Bill Payment •Gas Bill Payment •Insurance •Water Bill Payment •Municipal Recharge	•Indian Railways •Urbanclap •Flight Tickets Booking •Bus Ticket Booking •Train Ticket Booking	•Mobile Recharge •Airtel Recharge •BSNL Recharge •Idea Recharge •Jio Recharge •MTNL Recharge •Vodafone Recharge •Mobile Bill Payment •Datacard Recharge •Datacard Bill Payment •Dth Recharge	•Fee Payment •Google Play Recharge •Fastag •QR Code Scanner •& •Movie Ticket Booking •Events Booking	•Aditya Birla Sun Life Insurance •Aegon Life InsuranceBajaj Allianz Life Insurance •Bharti AXA Life Insurance •Reliance General Insurance •Reliance Nippon Life Insurance •Religare Health Insurance •Royal Sundaram General Insurance •SBI General Insurance Limited •SBI Life Insurance •Shriram General Insurance

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UGC Care Listed

Articles

A Time-Series based analysis on the Changing Momentum of Gold, Crude, Nifty 50, Nasdaq, USD/INR and Shanghai Index with reference to COVID 19 Pandemic

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Abstract: In the wake of the COVID 19 pandemic, the global economy is facing yet another crisis like "The Great Depression". This study tries to examine the changing co-movement pattern of variables like Nifty 50, Shanghai Index, NASDAQ, Gold, Crude and USD/INR exchange rate with the help of time series analysis. The daily percentage changes in the above-mentioned variables were used for the analysis. The data was collected for one year and two separate half-yearly analysis was done i.e. first 6 months of data set was from June 23rd, 2019 to Nov 15th, 2019(Pre covid) and the next half year was from November 17th to June 23rd, 2020(post covid). Nov 15th was taken as midpoint because the first covid case was reported on that date. The intention was to examine the changing momentum of variables before and after the outbreak of Covid 19. Statistical and econometrics techniques like Correlation, Augmented Dickey-Fuller Test and VAR based Granger causality tests were used. The results showed that before the outbreak, the gold movement was influenced by the changes in the Shanghai index, but after the outbreak, the later has started moving based on the changes in the Nifty and Nasdaq index. surprisingly, Nifty was found to be moving independently from other variables.

Keywords: Covid 19, Gold, Momentum, Augmented Dickey-Fuller Test.

Article History

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1. Introduction

The outbreak of the novel corona disease (COVID-19) which spread across created great havoc to the various aspects of the Indian economy. The challenge is how to manage the fact that those

changes bring while balancing the market-related volatilities. It has brought everything to a standstill. The equities, crude oil, and currency market have collapsed, as a result of the outbreak.

Due to the geopolitical uncertainty, disruption of the economic activities, and a global slump in economic growth, which led investors away from the risky assets, thus increasing the appeal for gold as a safe haven. As on the 16th of August 2020, gold is trading at 1,944.80 dollars per ounce in the international market which justifies the conservative stand taken by the investors. On the other hand, the Crude market too has seen a collapse in the demand.due to a decrease in consumption. The Purchase Managers Index(PMI) shows that the manufacturing activities in India's economy are showing negative growth for the last two months(June-47.2 and July -46) (***India Purchasing Managers Index (PMI), Manufacturing, July, 2020 - Data, Chart | TheGlobalEconomy.Com***, **n.d.**).PMI has signaled a decline in consumption which draws a gloomy picture to the GDP growth story. The NSE's index Nifty 50 has also seen a knee jerk reaction to the financial turbulence wherein it got corrected to 7000 levels due to the contagion impact.

Economists are warning a situation similar to the great depression of 1929. Various forecasts show that the situation is grim. For instance- As the year began, India was seen growing at 5%. Now, the Indian GDP is seen shrinking by the same rate. Asian development bank has even forecasted that the covid hit Indian economy will contract by 4% in FY 2021 This study tries to throw light on the change in the comovement pattern of the selected variables (Gold, Crude, Nifty, USD/INR, Shanghai index and Nasdaq) after the outbreak of a COVID-19 pandemic.

2. Literature Review

(Sathyanarayana & Gargesha, 2018) studied in detail the fluctuations of crude, gold, and forex prices and their impact on the stock market for seventeen years from 1st January 2000 to 31st March 2017. They have used multiple regression and ADF test. They concluded that there exists a statistical relationship between Crude and Dollar with BSE Sensex and Nifty 50 while, buying or selling any stocks or constructing a portfolio the market participants should take the momentum in forex and crude prices seriously. (Ingalhalli et al., 2016) analyzed the causal relationship between oil, gold, and exchange rate and the stock market in India. They have taken ten years of data ranging from January 2005 to July 2015. The usage of statistical tools like correlation and Granger causality tests revealed that oil prices contribute towards forecasting the

exchange rate and gold prices, whereas fluctuations in oil prices are granger caused by the stock price index (Sensex).

(Simakova & Šimáková, 2016) examined the relationship between oil and gold prices. The main objective was to determine the character of the co-movement between price levels and determinants of current price trends which included a quantitative analysis of the variables using techniques such as the Granger causality test, Johansen cointegration test, and Vector Error Correction model. Regarding the Granger causality test, causal links between gold and oil price levels were identified. Johansen cointegration test revealed a long-term relationship between examined variables and the Vector Error Correction model confirmed, those aftermarket fluctuations, both time series return to long- term equilibrium.

(Bhunia & Pakira, 2014) conducted a study on the affiliation of three financial variables namely gold price, exchange rates, and Sensex. They have used daily data with the application of unit root test, Johansen cointegration test, and Granger causality test. The study was based enormously on secondary data acquired from the RBI database, BSE database, and World Gold Council database for the period from January 2, 1991, to October 31, 2013. They concluded that there is an indication of the impact of gold price and exchange rates on Sensex in the long period and the Indian stock market is further obsessed by Indian macroeconomic causes more willingly than global causes.

(Arfaoui & Ben Rejeb, 2017) founded that there is a negative relationship between oil and stock prices but the oil price is significantly and positively affected by gold and USD. They examined in a global perspective, the oil, gold, US dollar and stock prices interdependencies and identified instantaneously direct and indirect linkages among them.

(Geete, 2016) studied in detail the impact of gold price and USD/INR exchange rate on Indian stock market indices. For the study, secondary data for 3 years, starting from 2011 to 2014 were used. He tested the multiple regression model and concluded that both dollar and gold prices were having a positive effect on the stock market indices. (Mohanamani et al., 2018)studied the dynamic relationship between gold, oil, exchange rate and stock market prices. To assess the dynamic linkages, the Johansen Cointegration test and Granger Causality Tests were used. They collected data from daily spot prices from the world gold council, daily spot oil prices from OPEC, the daily exchange rate between INR and USD from the Reserve Bank of India and BSE

Sensex returns are used as a proxy to measure the Indian stock market prices. The study revealed that the increase in oil prices leads to an increase in exchange rate fluctuation and also, has a long-term impact on the movements of stock markets.

3. Significance of the Study

The Covid 19 pandemic has wreaked havoc in the international markets turning the global markets extremely volatile and the majority of the asset classes are looking at huge losses. From the previous studies (as given in the literature review), it was found that the selected variables of this research work i.e. Gold, Crude, Nifty 50, NASDAQ, Shanghai Index and USD/INR rate did have a relationship in terms of correlation and cointegration. This study is significant because the authors have taken the daily data for the last year starting from June 23, 2019, to June 23, 2020, for analyzing the change in the dynamics of the selected variables in the post covid markets.

4. Objectives of the Study

- To analyze the changing relationship of the selected variables in terms of daily price changes before and after the outbreak of the Covid 19 pandemic.
- To find out whether a selected variable could be used for predicting the short term movements of other variables.

Hypotheses

H01-There exists no relationship in the price movements of Gold, Crude, Shanghai Index, NIFTY 50 index, USD/INR exchange rate, and NASDAQ index.

H02-Price movements in Gold granger cause the movements of Crude, Shanghai Index, Nifty 50, USD/INR exchange rate and NASDAQ respectively and vice versa.

H03- Price movements in Crude granger cause the movements of Gold, Shanghai Index, Nifty 50, USD/INR exchange rate and NASDAQ respectively and vice versa.

H04-- Price movements in Shanghai Index granger cause the movements of Gold, Crude, Nifty 50, USD/INR exchange rate and NASDAQ respectively and vice versa.

H05- Price movements in Nifty 50 granger cause the movements of Gold, Crude, Shanghai Index, USD/INR exchange rate and NASDAQ respectively and vice versa.

H06- Price movements in USD/INR exchange rate granger cause the movements of Gold, Crude, Shanghai Index, Nifty 50 and NASDAQ respectively and vice versa.

H07- Price movements in NASDAQ granger cause the movements of Gold, Crude, Shanghai Index, Nifty 50 and USD/INR exchange rate respectively and vice versa.

5. Research design

This is a crucial area for any type of research as the accuracy and reliability of any research is based on the framed research design. For the present study, the contents of the design are as follows:

- Variables: Gold, Crude, NIFTY 50 index, NASDAQ index, USD/INR exchange rate and Shanghai Index.
- Data Period: Analysis is based on the daily closing data from June 23, 2019, to June 23, 2020.
- Source of Data: Data is collected from sources like the NSE website and investing .org. and is secondary.
- Research Methods: Basic Statistical tool like Correlation and Various econometrics tools like Augmented Dickey-Fuller Test (ADF and Granger Causality test was used.

5.1 Correlation

The correlation has been used in this paper as a precursor of time series based data testing. The author was trying to find out the relationship among various variables so that the authors could proceed with econometrics based analysis.

5.2 Augmented Dickey-Fuller Test

A prerequisite for testing the Granger causality based on time series is to ensure that the data sets are stationary.ADF test (Dickey & Fuller 1981) was run to examine whether the variables had unit root or not. The lag selection was based on AIC (Akaike information criteria). This analysis is conducted based on the assumption that the time series data used for the modeling are not stationary.

Hypotheses

- The null hypothesis for this test is that there is a unit root.
- The basic alternate is that the time series is stationary (or trend-stationary).

Types

The Augmented Dickey-Fuller adds lagged differences to these models:

No constant, no trend: $\Delta yt = \gamma yt\text{-}1 + \sum_{s=1}^{m} as\Delta yt\text{-}s + vt$ .....(1)

Constant, no trend: $\Delta yt = \alpha + \gamma yt\text{-}1 + \sum_{s=1}^{m} as\Delta yt\text{-}s + vt$.....(2)

Constant and trend: $\Delta yt = \alpha + \gamma yt\text{-}1 + \lambda t + \sum_{s=1}^{m} as\Delta yt\text{-}s + vt$.....(3)

5.3 Granger Causality Test

Sathyanarayana and Gargesha (2018) had used the granger causality test to find out the sh term trend between Nifty 50 and other variables like crude, gold and forex prices. This study al makes use of the granger causality test (Var based) to determine the short term causal effi among the variables. For testing the relationship, an augmented dickey fuller test was run check for the unit roots in the variables. When the stationarity of the variables was establish the granger causality test was conducted for each equation in the model.

Granger causality can be conducted in three steps :

Firstly, we regress y on y lags without considering the lags of x.

$yt = a1 + X\ m\ j=1\ \gamma j\ yt{-}j + et$ .....(4)

then, we include the lags in x and regress it again

$yt = a1 + X\ n\ i=1\ \beta i\ xt{-}i + X\ m\ j=1\ \gamma j\ yt{-}j + et$ .....(5)

Finally, the null hypothesis that $\beta i = 0\ \forall i\ u$ is tested, using an F-test.

6. Analysis and findings

Table 1: Correlation matrix (Pre covid data)

Correlations

		Nifty	NASDAQ	USDINR	Gold	Crude	Shangha i
Nifty	Pearson Correlation	1	.011	-.042	.053	-.009	.053
	Sig. (2-tailed)		.917	.685	.606	.934	.604
	N	97	97	97	97	97	97
NASDAQ	Pearson Correlation	.011	1	-.668**	-.276**	.025	.144
	Sig. (2-tailed)	.917		.000	.006	.811	.160
	N	97	97	97	97	97	97
USDINR	Pearson Correlation	-.042	-.668**	1	.117	.117	-.187
	Sig. (2-tailed)	.685	.000		.253	.255	.067
	N	97	97	97	97	97	97
Gold	Pearson Correlation	.053	-.276**	.117	1	-.029	-.148
	Sig. (2-tailed)	.606	.006	.253		.780	.148
	N	97	97	97	97	97	97
Crude	Pearson Correlation	-.009	.025	.117	-.029	1	.032
	Sig. (2-tailed)	.934	.811	.255	.780		.755
	N	97	97	97	97	97	97
Shangha i	Pearson Correlation	.053	.144	-.187	-.148	.032	1
	Sig. (2-tailed)	.604	.160	.067	.148	.755	
	N	97	97	97	97	97	97

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

Table 2: VAR Granger Causality/Block Exogeneity Wald Tests(Pre Covid)

Dependent variable: SHANGAI			
Excluded	Chi-sq	df	Prob.
CRUDE	0.006125	1	0.9376
GOLD	**4.291284***	1	0.0383
NASDAQ	0.451503	1	0.5016
NIFTY	3.94E-05	1	0.9950
USD_INR	0.104865	1	0.7461
All	5.038550	5	0.4112
Dependent variable: USD_INR			
Excluded	Chi-sq	df	Prob.
CRUDE	0.066233	1	0.7969
GOLD	0.124217	1	0.7245
NASDAQ	0.001113	1	0.9734
NIFTY	0.000106	1	0.9918
SHANGAI	**4.059110***	1	0.0439
All	4.633578	5	0.4622

Source: E- views software

The first half of the collected data which reflects the movement 6 months before the outbreak of the pandemic (from June 23 – Nov 15, 2019) was taken for analyzing the trend of selected variables. The daily data were transformed using the square root method and the augmented dickey fuller test was performed for ensuring the stationarity of the variables. The variables which were found to be stationarity at the level were further fitted with the Var model. The criteria selection was done based on the Akaike Information Criteria (AIC). The fitted VAR model was used to run the Granger Causality Test.

The results showed that there existed a short term relationship between the movements of Gold and Shanghai Index (dependent variable). It was also interesting to note that the Shanghai Index influenced the price movements of the USD/INR exchange rate.

Table 3: Correlation (post covid 19)

Correlations

		NASDAQ	NIFTY	USDINR	CRUDE	GOLD	SHANGHAI
NASDAQ	Pearson Correlation	1	.241**	-.188*	.016	.225**	.082
	Sig. (2-tailed)		.003	.021	.842	.006	.318
	N	150	150	150	150	150	150
NIFTY	Pearson Correlation	.241**	1	-.276**	-.049	-.247**	.086
	Sig. (2-tailed)	.003		.001	.550	.002	.295
	N	150	150	150	150	150	150
USDINR	Pearson Correlation	-.188*	-.276**	1	-.004	-.032	-.034
	Sig. (2-tailed)	.021	.001		.958	.700	.682
	N	150	150	150	150	150	150
CRUDE	Pearson Correlation	.016	-.049	-.004	1	.025	-.010
	Sig. (2-tailed)	.842	.550	.958		.764	.908
	N	150	150	150	150	150	150
GOLD	Pearson Correlation	.225**	-.247**	-.032	.025	1	.042
	Sig. (2-tailed)	.006	.002	.700	.764		.610
	N	150	150	150	150	150	150
SHANGHAI	Pearson Correlation	.082	.086	-.034	-.010	.042	1
	Sig. (2-tailed)	.318	.295	.682	.908	.610	
	N	150	150	150	150	150	150

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

*. Correlation is significant at the 0.05 level (2-tailed).

Source: SPSS

Table 4: VAR Granger Causality/Block Exogeneity Wald Tests (post covid)

Dependent variable: NASDAQ			
Excluded	Chi-sq	df	Prob.
CRUDE	0.087730	1	0.7671
GOLD	**8.508149***	1	0.0035
NIFTY	2.071350	1	0.1501
SHANGAI	0.013060	1	0.9090
USD_INR	2.938039	1	0.0865
All	19.90705	5	0.0013
Dependent variable: GOLD			
Excluded	Chi-sq	df	Prob.
CRUDE	0.015828	1	0.8999
NASDAQ	**4.266200***	1	0.0389
NIFTY	**33.59804***	1	0.0000
SHANGAI	0.203629	1	0.6518
USD_INR	0.536951	1	0.4637
All	38.73318	5	0.0000

The second half of the collected data reflects the movement of selected variables six months after the outbreak of the pandemic (from Nov 16, 2019 – June 23, 2020). The data was taken for analyzing the trend of selected variables and a similar process was followed for transforming the data and ensuring the stationarity of the data set. A significant shift was found in the relationship among the various variables after the pandemic outbreak which had dug a hole in the global economic fabric. The analysis also showed that Gold prices were impacting the movement of the NASDAQ index. It was also interesting to note that the Gold movements were influenced by the

changes in the Nifty 50 index and NASDAQ respectively. Further, the influence of Nifty was found to be of substantial importance in terms of changes in Gold price movements.

7. Conclusion

The analysis points out the covid 19 outbreak has changed the co-movement pattern of the selected variables. Before the outbreak, the gold movement was influenced by the changes in the Shanghai index, but after the outbreak, the later has started moving independently. It was surprising to note that none of the chosen variables have influenced the movement of the Nifty 50 index for the selected period. Rather than mimicking the movements of a commodity like gold or an overseas index like Shanghai or Nasdaq, Nifty had largely moved based on the domestic factors. The gold market's dependence on the Nifty 50 index and NASDAQ reflects that consumption wise both the economies were major players in the gold market and the safe haven tag of gold was grabbing more attention from investors. The dependence of gold on the Nifty Index can be substantiated by a study that was conducted by the World Gold Council and Federation of Indian Chambers of Commerce and Industry (FICCI). The study pointed out that 77% of the respondents considered gold as a safety trigger in case of volatility(**Dhawan, n.d.**). This preference makes gold a safe haven for Indian households and an asset to depend on at the time of slowdown or recession.

Covid 19 pandemic has made the Indian and Chinese stock market movements independent. The momentum of indices like Nifty and Shanghai are not interrelated and are not influenced by changes in commodities like crude and gold. This also points out that the recovery period from the corona impact will be different for both these markets. However, the discovery of vaccines like Sputnik 5 gives the world a ray of hope. This can be a turning point that would mark an end to the pandemic and thereby ending the financial turbulence and uncertainties in the market.

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An Exploratory Research to Analyse the Current Level of Technological Support for Adaptive Ageing in the Digital Era with Reference to Kerala State in India

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ABSTRACT

At the dawn of this digital era, Indians are faced with a plethora of technological services and digital devices. These services offered on digital platforms not only support intellectual curiosity and increased social interaction but provide increased safety and expedite tedious processes such as money transfers, thereby bettering the quality of life. Although the advent of these services holds great promise for all, older adults find it difficult to adapt to these new techniques. As the benefits of technology for seniors are plentiful it becomes imperative to understand the hurdles faced by them in adopting these new technologies. Currently every country in the world is experiencing an exponential growth in the percentage of seniors in their population. So, it is essential to ascertain the challenges faced by seniors when they attempt to employ technological services. This study proposes a model DATS [Digital Assistive Technology for seniors] that may guide future researchers in enabling the elderly to reap the benefits of technological services.

Keywords

DATS [Digital Assistive Technology for Seniors]; Ageing well; Digital revolution; Digital literacy, Technology adoption; Technology acceptance; Digital economy; Assistive technology;

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Introduction

Digital India, a prominent initiative launched by the Government of India aims to transform India into a country of digitally literate citizens. This transformation process is challenging in a country like India, where more than 300 million citizens do not possess credit / debit cards or smart phones and are also not financially literate enough to handle PINs, passwords etc. and their implied securities. Among the total population nearly one third can be classified as senior citizens. The number of elderly persons in India in 2011 was 90 million and is expected to escalate to 173 million by 2026 as pointed out by the report released by the United Nations Population Fund (UNPF) and Help Age India (Harikrishnan, 2012). The (India Ageing Report, 2017) noted that 30 million amongst the 90 million elderly surveyed were living alone and further 90% needed to work for their livelihood.

As humans age, they take more time to react to simple stimuli and to learn new material. This decreases their capacity to adapt to changes. Their increasing age can also impair their auditory and visual capabilities. This is often coupled with more temporal variations in sensory, motor, and abstract cognitive abilities than in those younger than them (Stern et al., 2000). This deterioration in adaptability was not addressed by the technology of the yester years. The advent of computers that are powerful yet easily embedded in other technological devices and processes has paved the way for constructing technology that can be easily embraced by the elderly.

One of the challenges faced by Digital India is to ensure safe and easy to use digital modes of transactions among senior citizens. The area of this study includes the identification of the challenges in technology usage among senior citizens. The study determines the pattern of usage of digital devices among senior citizens, so that it may open avenues of research, to identify technologies that will enable seniors to confidently use the digital platform to enhance their lives.

Understanding the Ageing Scenario Through A Literature Review

A relative increase in the number of seniors in a population is referred to as ageing. It has been noted that for elders who are able to embrace the online technological services it forms an essential part of their day to day living.

Global Scenario

A marked increase in the percentage of senior citizens in the population is being seen all over the world. The 2017 Revision of the World Population Prospects predicts that by 2050, the number of senior citizens will be at least double and by 2100 triple the present number (United Nations-Department of Economic Affairs, 2017). In 2017 senior citizens accounted for 13 per cent of the global population and numbered about 962 million and their sub-population was increasing yearly at a rate of about 3 per cent. Currently, this sub- population is highest in Europe at 25 per cent. With ageing on an upward spiral, it is expected that by 2050 senior citizens will account for nearly quarter of the population globally except in Africa. The recent study (World Health Organization – Ageing and Health, 2018) has estimated that the global population of senior citizens would number about 1.4 billion in 2030, 2.1 billion in 2050,

and may rise to 3.1 billion in 2100, while the population aged 80 or over is anticipated to increase from 137 million in 2017 to 425 million in 2050. It is predicted that the population of aged people in 2100 would be seven times its strength in 2017.

Indian Scenario

The Population Census of 2011 revealed that elderly males numbered 5.1 crore and elderly females 5.3 crore so that the subpopulation of elderly totalled to 10.4 crore. It was also observed that the size of the elderly population was continuously increasing over time, from 5.6 per cent in 1961 to 8.6 per cent in 2011, wherein the male subpopulation had increased to 8.2 per cent, while the female subpopulation was marginally higher at 9.0 per cent (State Planning Board–Economic Review [SPBER], 2017). The study (SPBER, 2017) also noted that among the elderly the ratio of rural to urban residents was 71:29.

Kerala Scenario

In 1961 the population aged 60 and over was found to be 5.1 per cent of the total in Kerala which was just below the national proportion of 5.6 per cent. However, since 1980, Kerala has overtaken the rest of India vis a vis this sub-population. In 2001, this ratio stood at 10.5 in Kerala which was far higher than the national proportion of 7.5 and in 2011 it shot up to 13 percent. The study conducted by the Centre for Development Studies ("The New Indian Express", 2014) points out that the subpopulation of elderly in Kerala is perpetually increasing at a rate of 2.3 per cent. Among the elderly the growth rate of the sub population of elders aged 70 or 80 and above is also high (SPBER, 2017). Currently, seniors of age over 60 years number 42 lakhs in Kerala and 13 per cent of them are 80 years and above, the fastest growing subset among the aged.

Background Study

Adoption Vs. Acceptance Of Technology.

For the Digital India Initiative to succeed it is imperative to realise the fine distinction between adoption and acceptance of technology. Adoption of technology would imply the awareness of the technological process and embracing it as a part of one's lifestyle. A positive attitude towards technology would mean an acceptance of it.
Numerous technology acceptance models have been recommended and are briefly discussed below.

Technology Acceptance.

Technology acceptance and adoption are vital factors in the exploratory study into marketing, ergonomics, pedagogy, psychology, and sociology. Of the available models the Technology Acceptance Model (TAM) proposed by Davis (Technology Acceptance Model[TAM], n.d.), with two main factors influencing an individual's intention to use new technology that is perceived ease of use and perceived usefulness is of significance. While some of the senior citizens may feel that digital games are beyond their comprehension or are a waste of time and so may not venture to learn to utilise this technology, other seniors may think of these games as much needed and easily available mental stimulation and so may be inclined to master them. TAM works on the hypothesis that when a technology is perceived by a person as useful and easy to use, they will be inclined to utilise it. TAM functions as an outline and is in accordance with several studies on the dynamics that guide older adults' objective to use new technology (Charness et al., 2016).
The prediction of the acceptability of an information system is of vital importance in the TAM. However, some studies have pointed out the shortcoming of TAM in not perceiving the interconnection between technology and its assimilation and utilisation. Although research published in this topic perceived usefulness as an important predictor in TAM model, in online gaming where technology is utilised for entertainment or to relax and pass time this is not relevant as pointed out by (Ajibade, 2018).
The acceptance and utilisation of hedonic-motivation systems (HMS) mostly used for pleasure rather than productivity is increasingly becoming relevant to the global economy. The Hedonic Motivation System Adoption Model (HMSAM), an extension of TAM, is a HMS-specific system acceptance model grounded on flow-based cognitive absorption (CA) and seems more suitable as it is based on an alternative theoretical perspective (Lowry et al., 2013). By including CA as a key mediator of perceived ease of use (PEOU) and of behavioural intentions to use (BIU) the HMSAM extends the acceptance model proposed by van der Heijden, to a hedonic system (Heijden et al., 2004).
Taking into cognizance the distinctive individualities, competencies and limitations of the elderly in the acceptance of technology Renaud, K. and van Biljon, J. proposed the Senior Technology Acceptance Model (STAM) (Biljon et al., 2007), tailored specifically to the acceptance of mobile phones among seniors.. The improvement of STAM over models like TAM which study technology acceptance is that it focuses on understanding technology acceptance by senior users (Biljon et al., 2008), (Jia et al., 2015).
This paper focuses on ascertaining the elements which contributes to the acceptance of technology by elders, by seeking an answer to the query: "Does the ease of use of technological devices influence their acceptance by the elderly?" This would lead to avenues of further research to enhance technological devices by making them easier to use for the elderly, thereby, greatly enriching the quality of their ageing.

Scope of the Work

The study aims at identifying the requirements and usage of digital devices among senior citizens with reference to Kerala.

Why Kerala

Among the states of India, Kerala is ageing fastest.
The high proportion of elders in the population has a lot of repercussions on the socio-economic status quo of Kerala. In the traditional Indian culture of joint family systems, the

extended family provided adequate social and financial security for the elderly. However, the current nuclear family system hardly provides any care for the elderly. This scenario is further aggravated by the migration of a large number young and middle aged overseas (especially to Gulf Countries), in search of job prospects leaving the elderly to fend for themselves. An interesting fact is that the State has 4 International Airports. Further, most women, the traditional care givers of the family who provided the mental and physical sustenance to the elderly are now engaged in jobs outside their homes. The culture of sending elderly persons to Old Age Homes is therefore becoming prevalent. The age configuration of Kerala's Senior Citizens is given in below.

Table 1: Age Composition of Kerala's Senior Citizens

Age composition	Total	Men	Women
Total population	33,406,061	16,027,412	17,378,649
Total old age population	4,193,393	1,853,595	2,309,798
60-69	2,416,805 (58%)	1,114,368 (60%)	1,272,437 (55%)
70-79	1,234,739 (29%)	534,879 (29%)	699,860 (30%)
80+	541,849 (13%)	204,348 (11%)	337,501 (15%)
Source: Census of India, 2011			

Kerala Disability Census 2015.

According to the Census 2011 there were 41, 93,393 Senior Citizens in Kerala, the major disabilities among them being the loco motor and visual disabilities. However, the Disability Survey of 2015 revealed that there were 8,217,434 households with a population of 34,254,086 of whom 4,233,474 were Senior Citizens constituting 12.36 % of the total. 1,934,758 of the Senior Citizens were male and 2,298,716 were female. Also 432,953 of the households that is, 5.27 % of the total comprised only of Senior Citizens (SPBER, 2017).

Special Reference To Usage Of Smart Devices By Elderly In Kerala.

The state of Kerala whose population numbers about 33 million, boasts of more than 30 million mobile phone users. As 40 % of the population has access to the internet, the proportion of smartphone users is continually increasing. Telecom regulator TRAI (Jose, 2017) estimates that more than 20 % of the households in Kerala utilise high-speed broadband and about 15% of them accesses the internet on smartphones.

Kerala boasts the country's highest life expectancy at birth - 71.8 and 77.8 years for men and women, respectively. Thiruvananthapuram based psychologist Shiju Joseph (Jose, 2017), has pointed out that, smartphone-aided digital infrastructure has greatly bettered the quality of the lives of the elderly subpopulation, who constitute 13 % of the total and until now spent their time on routine activities.

By ensuring broadband connectivity to all villages under the National Optical Fibre Network project Kerala had become India's first 'digital' state. As Kerala is also a fully literate state the digital revolution empowered by smart devices has completely transformed the entire lifestyle of its people. This transformation has been highly profitable for many data and smart device companies who now have found new clients in over four million senior citizens of the State.

The study 'On the Road to Digitization: The Case of Kerala', by Anindita Paul and Radhakrishna Pillai of IIM Kozhikode (Jose, 2017) emphasizes that the digital programmes of Kerala have been exemplary, and that the Malappuram district has become the country's first fully e-literate district where the utilisation of smart gadgets is extremely high, possibly due to monetary remittances from West Asia.

Kerala's achievement in the e-sphere is attributed to the visionary measures of the government through the projects like Akshaya and IT@School way back in 2002 which opened the doors of digital literacy to its citizens (Abraham, 2015). IT@School was later transformed into Kerala Infrastructure and Technology for Education (KITE) in August 2017. KITE supports the State Government's Public Education Rejuvenation Mission (Pothu Vidyabhyasa Samrakshana Yagnam) with schemes such as Samagra Content Portal, Sampoorna School Management software etc(Kerala Infrastructure and Technology for Education, 2019).

Research Questions

What are the digital devices currently used by senior citizens?
What are the digital services preferred by senior citizens?
What is the level of acceptance of digital device usage by senior citizens?
What is the level of comfort enjoyed by senior citizens for using digital devices?
What is the level of support sought by senior citizens for using digital devices?
Are senior citizens aware of various digital services currently available for common usage?
Does education, employment, and financial status have an impact on the acceptance of digital devices by the senior citizens?

Research Gap

Modern technology is easily embraced by the young. However, older adults face several hurdles in adopting them, despite the enormous direct and indirect benefits they hold such as:
Medical interventions using technological advancements
Access to various financial and health schemes of Government.
Social connectivity
Entertainment
In enhancing the capability of the senior citizens in the utilization of these digital devices, one would be greatly contributing to enhancing their quality of life.

Research Methodology and Data Analysis

Employing simple random sampling an exploratory survey was undertaken, the sample size being 90. A comprehensive questionnaire was administered sometimes accompanied by a face to face interview.

Participants Age

The age wise distribution of the respondents was as follows: 50% of the respondents belong to 60 to 80 age group, 34% of the respondents belongs to 40 to 60 years, remaining 16% of the respondents were more than 80 years old.

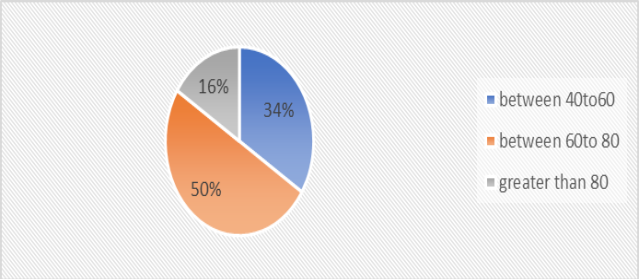

Fig 1- Age wise distribution

Sex

53% of the respondents were Male and 47% Female.

Education

37% of the respondents had studied up to the Undergraduate level, 37% till PUC/12, 20% were below secondary school level, 3% finished diploma and 3% were post graduate.

Income

The income of 38% of the respondents were below Rs. 50000 pa, 24% were earning between Rs.50000 and Rs.1 lakh pa, 14% were earning between Rs. 1 lakh and Rs.2 lakh, 21% were earning between Rs. 2 lakh and Rs. 5 lakh and 3% were earning between Rs.5 Lakh and Rs. 10 lakh pa.

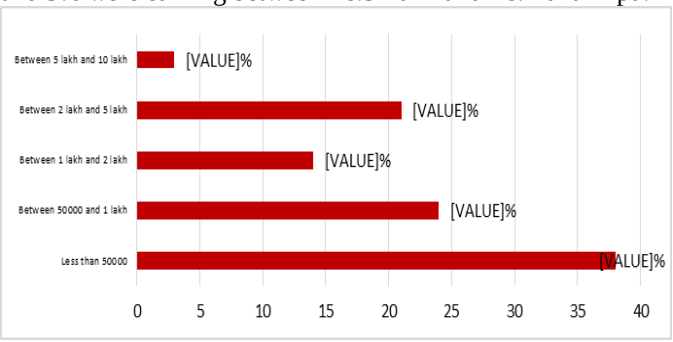

Fig 2- Income Distribution

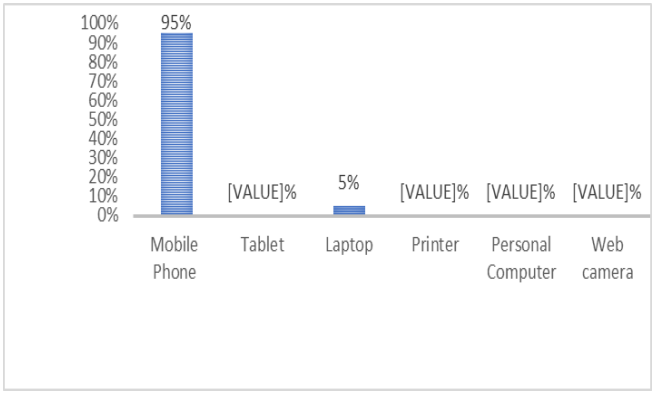

Fig 3 - List of electronic devices used

Electronic Device Usage

It was found that 95% of the elderly used mobile phones and 5% used laptops.

Data Analysis

The most common digital service used by most of the senior citizens was ATM transactions. It accounted for 44% of all digital services.

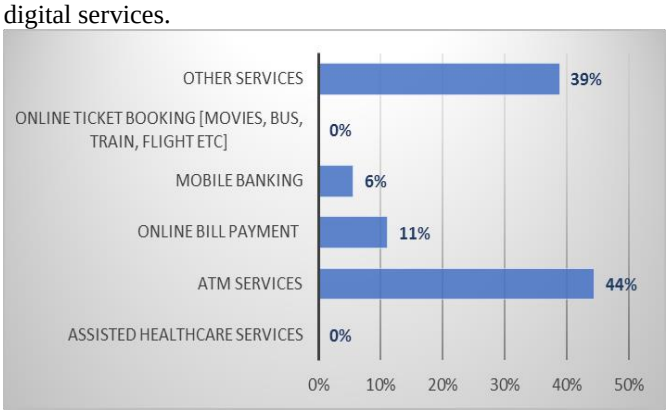

Fig 4 - The services used through digital devices

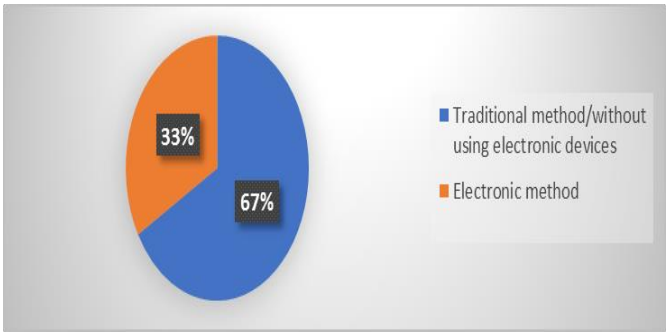

Fig 5 - Most preferred mode of service

The most preferred mode of service for the senior citizens was found to be the traditional method which accounts for 67% whereas 33% preferred electronic mode of doing transactions.

It was found that 90% of the senior citizens had sought help to use electronic devices and services.

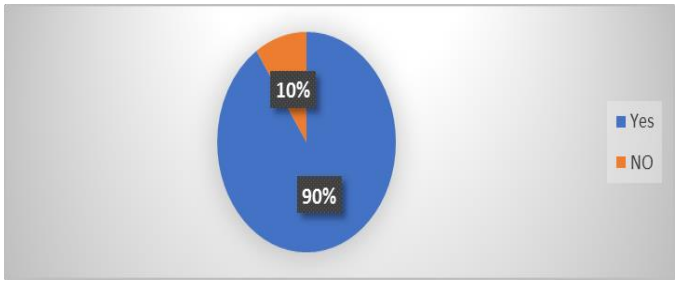

Fig 6 - Do you seek help when using electronic devices and services?

The senior citizens had expressed varied levels of interest in learning new technologies with 15% always willing to learn and 50% willing to learn new technologies if needed.

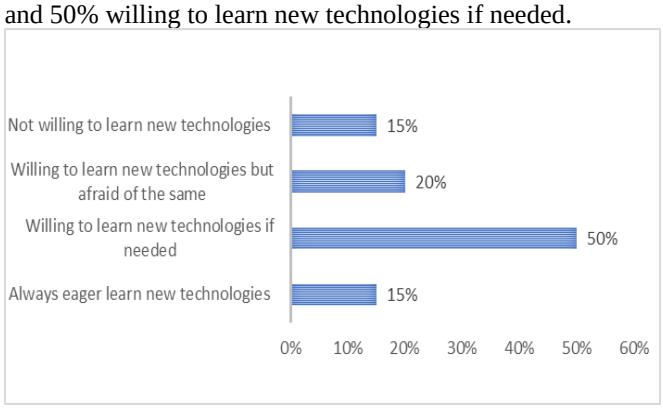

Fig 7 - Level of interest in learning new technologies

The level of comfort of senior citizens in using electronic devices is shown in the figure below.

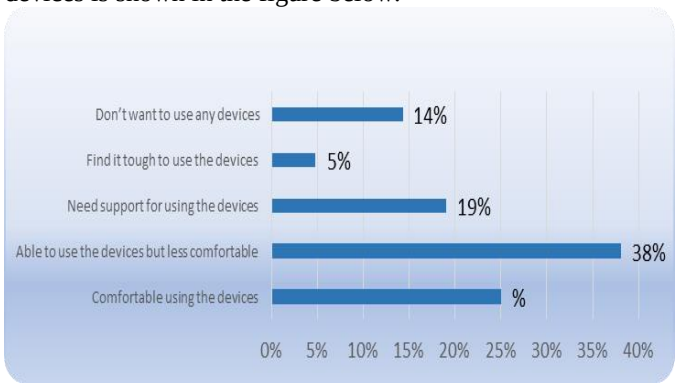

Fig 8 - Level of comfort for using electronic devices

WhatsApp and Facebook are the most visited social networking sites by the elderly.

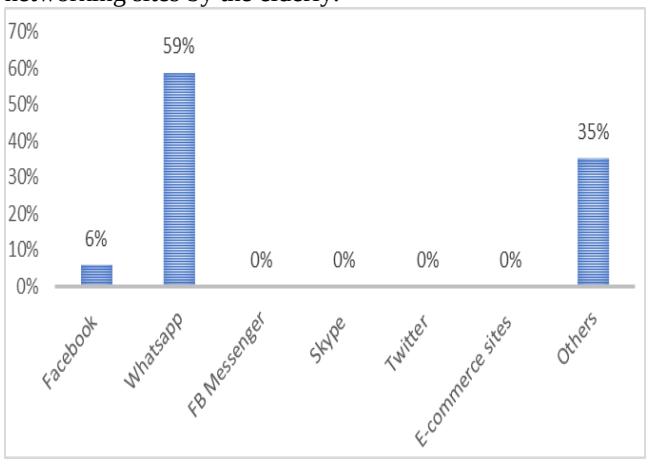

Fig 9 - The social networking sites visited often

94% of the elderly are found to be happy to use the social media and found it not obstructing their daily life activities.

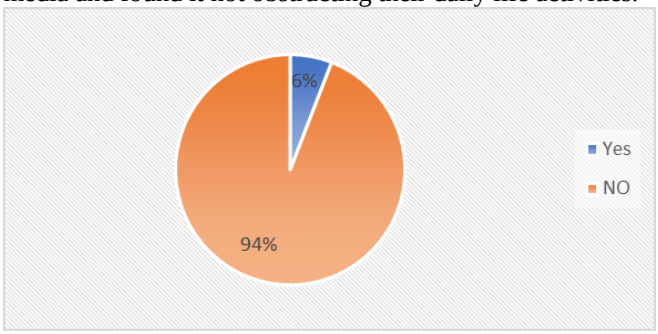

Fig 10 - Does usage of social media reduce your productivity?

68% of the elderly were found to spend less than an hour using technological devices.

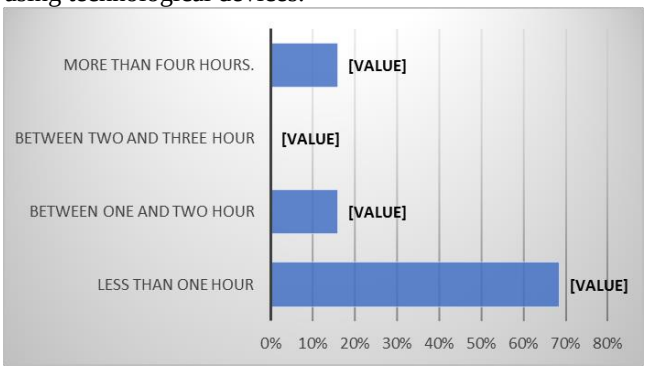

Fig 11 - On an average, how much time in a week do you spend on technological devices

On employing the chi square test using the R statistical package it was found that for the sample under study the level of usage of digital devices was dependent on the age of the respondent. However, it was seen that the level of usage of digital devices was independent of the gender of the respondent.

Results and Findings of the Study

Attitude

The study revealed that nearly 65 % of senior citizens were willing to learn new technologies, which is consistent with the findings of Kim (González et al., 2012). On interacting with the seniors surveyed some of them professed that the utilization of digital devices would usher lifelong learning and better social interactions. One observation was that, even academically well qualified elders, for example, retired bank employees were not comfortable in using digital devices, including ATM services. Further, some of the elderly were found to be memorising the operation steps to be performed on the digital devices, which makes us to wonder whether digital devices bettered their quality of life.

The survey found that only 20% of the elders evinced interest in new technology whereas 80% of them preferred to use the traditional modes of banking, payment etc. that they were familiar with. As seniors who are engrossed in improving their knowledge using the computer are found to be more capable, self-reliant, and self-confident (Lin et al.,

2016), it is imperative to ascertain the psychological obstacles that prevent them to adapt to electronics mode of services.

Of the respondents of the study 76% had reported that they sought help from others to use the devices. This again provides impetus to seek enhancements of digital devices and services to make them usable by elders without seeking support (which may not be available in some cases).

The study revealed the attitude of senior citizens towards technology is positive and they are willing to learn new technology. That is psychologically they were willing to accept new technology but needed help in utilising them. Hence it is imperative to identify the factors to motivate them to adopt it.

Culture

In Kerala, where even highly educated youth, are unable to find employment commensurate to their qualification, international migration has been considered the norm, whereby they could improve their financial status and contribute to the upkeep of relatives in India. Such remittances are especially important for their aged relatives in India, who probably, neither receive a pension nor have a comprehensive health insurance, despite national and local efforts for a re-organization of social welfare. Thus for transnational families from Kerala, remittances help to enact labour migration as an elder care practice in itself (Ahlin et al., 2019).

Digital anthropology is the anthropological study of the relationship between humans and digital-era technology (Miller, 2018). Digital anthropology refers to the consequences of the growth of digital technologies for specific populations, the application of these technologies within anthropological methodology, or the study of digital technologies. The topic raises wider questions about the nature of contemporary anthropology. The question of what it now means to be human and how anthropology as a discipline should incorporate worlds that were neither preceded nor possible in the past will emerge. The study provides the impetus to study the Anthropological factors contributing to the acceptance of technology (Miller, 2018).

Fitness Factors

The two prevalent models often utilised in studies on technology acceptance, namely, the Technology Acceptance model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAT). were intended to elucidate the issues affecting the utilisation of technology by individuals. Recent reviews of research involving older adults have pointed out that the TAM and UTAT lack vital predictors of technology utilisation that are specific to older adults living in communities, including physical, psychological, and contextual factors.

Research should be carried out to identify the reason for technology usage by senior citizens. The study shows that only 14% of the elderly spend more than fours a week on an average on using technological devices and 90% of the respondents do not have problems like insomnia, due to longer screen time. As digital services may help the elderly to overcome physical and cognitive disabilities. They can be motivated to improve their usage (Sebastian et al., 2015).

Sociological Factors

TAM gives vital importance to the prediction of the acceptability of an information system. The limitation of TAM is that it does not account for social influence. Another inadequacy of TAM is that the only determining factor leading to actual system use is behavioural intention to use (TAM, n.d.).

Senior citizens prefer technological applications which can connect them to the society. This contributes in a major way to ageing well. Sociological factors may enhance the benefits of digital device usage and acceptance.

As per our study only 48% of the elderly are on WhatsApp which presumably help them connect to their relatives and peers. It would be to their benefit if elderly can be motivated to use technology to be in touch with their kin and colleagues through such apps.

Proposed Model Based on the Findings

Based on the findings, this paper proposes a model, Digital Assistive Technology for Seniors (DATS) , showcasing the factors to be considered in the formulation of assistive technology, which will in turn provide effective and efficient use of digital devices by the elderly, increase the acceptance and adoption of technology, there by assimilating them in the digital economy.

The model proposes that factors discussed above such as Psychology, Anthropology, Sociology and Health sciences have an impact on technology usage and needs to be considered while creating assistive technology for seniors which in turn can help the seniors in adopting newer technologies.

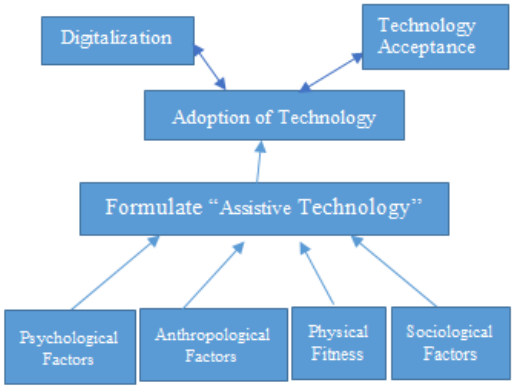

Fig12 - DATS [Digital Assistive Technology for Seniors]

Future research may formulate Assistive Technology by considering the factors from the fields of Psychology, Anthropology, Sociology and Health sciences along with the technological advancements like inventions of IoT devices and machine learning methods and AI, so as to increase the ease of use of digital devices for senior citizens

Conclusion and Future Enhancements

As the Government of India insists on the country moving towards the digital era, there exists more scope for research to identify and suggest methods to enhance the ease of use of digital devices for senior citizens thus help them in ageing well. As of now, the services used by the elderly persons are limited to mobile phone and core banking services. Even though they would like to utilise digital methods for other services and purposes, they are not confident enough and are less comfortable using it. Emerging research in the field of cognitive science may help to contribute to identifying and resolving the challenges faced by the senior citizens in using the digital devices. The researchers aim to suggest enhanced technological methods incorporating Artificial Intelligence and Internet of Things (IoT), that is utilising third wave technology to assist elderly to use second wave technology.

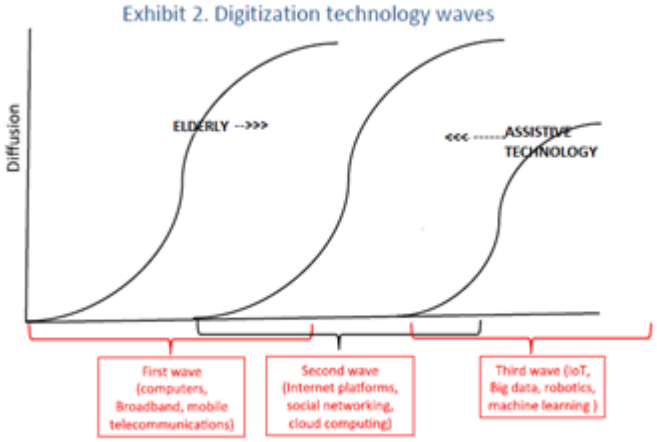

Fig13 – Digitization technology waves

This article is the consequence of a preliminary empirical study that has employed a questionnaire developed explicitly to quantify some characteristics exhibited by the elderly towards technology.
Further research to identify and formulate "Assistive Technology(ies)" is to be undertaken by employing technological advancements to augment the ease of use of digital devices by elderly thereby enhancing the quality of their lives.

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Research Article

Canker Detection in Citrus Plants with an Efficient Finite Dissimilar Compatible Histogram Leveling Based Image Pre-processing and SVM Classifier

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Abstract-The massive loss in agricultural yield mainly caused by leaf and fruit diseases. These diseases reduce both quality and quantity of agricultural products. As a major provenience of nutrients like vitamin C, citrus plants such as lemons, mandarins, oranges, tangerines, grapefruits, and limes are commonly grown fruits all over the world. As a result of various plant diseases, citrus producing companies make a huge amount of waste every year whereby 50% of citrus peel is destroyed every year. The disease canker is one of the mentionable leaf and fruit diseases. The main goal of this paper is to recognize and classify the canker disease precisely from the contrived leaf images by employing image processing techniques to detect plant leaf diseases from digital images. We offer a method consists of two phases to enhance the clarity of leaf images. The primary stage uses Finite Dissimilar Compatible Histogram Leveling (FDCHL) in preliminary step which advances the dissimilar level of disease influenced leaf image, segment the region of interest using fuzzy feature selection. The second phase by adopting the Support Vector Machine classifier to find out the canker leaf image and implements these methods in lemon citrus canker disease identification. Experimental results show effective accuracy detection and reduced execution time of canker disease detection.

Keywords: Canker Disease, Image Processing Techniques, Histogram Leveling, Gray-Level Co-Occurrence Matrix and Support Vector Machine.

1.Introduction

Agricultural production is directly turned down by plant diseases. The detection and classification of plants lesions are the main tasks to improvise the quality of plant production for economic growth. To increase the plant production for better economic growth, the process of recognition and classification of plants lesions are crucial. The occurrence of the disease on the plant result in substantial loss in both quality as well as the quantity of agricultural product. This can create the negative impact on the countries whose economies are primarily dependent on the agriculture. Hence the detection of the disease in plants is significant to avoid the financial loss.

In recent years, the leaf disease canker in citrus plants becomes one of the major acute diseases. Long period and traditional citrus medicinal plants such as lemon, orange are contrived by a canker disease which is a bacterial disease that affect the premature leaves and fruits of citrus plants. The proposed approach considers lemon leaves for classification of citrus canker disease because of high commercial cultivation crop. Lemon is an important source of vitamin C and contains flavonoid compounds that have distinct antioxidant and anti-cancer properties [2]. At the beginning stage of the disease, canker can be recognized by suddenly appeared some white spongy spots which is then turns into grey or brown later as shown in fig.1. The contrived location is characterized by oily margins or yellowish ring (lesions), which can be found on both sides of the leaves. This disease can be detected by the appearance of lesion on groves, stems and leaves. The symptoms appear as yellowish spots or halos on leaves that gradually enlarge to 2 – 4 mm dark brown pustules [7].

Figure 1 Citrus Canker Lesions in leaf and fruit

This citrus canker disease is caused by the bacterium Xanthomonas Axonopodis PV. Citric (XAC). The infection of citrus canker results in defoliation, dieback, tarnished fruit, reduced fruit quality, premature leaf and fruit and at last the trees will produce no fruits. Citrus canker is highly infectious and can be spread rapidly by

wind, rain, landscaping equipment, people work in field, moving infected or exposed plants or plant parts and it is difficult to eradicate. Detecting citrus canker at the early stage is the key to control and spreading of this disease.

Digital image processing [9] and image analysis technology based on the advances in real time applications such as microelectronics, computers, medicine and biology and it able to circumvents the problems. In this paper a new model for enhancement of pre-processing image with efficient contrast and to predict the canker disease in citrus plant (lemon) by classifier is implement. This approach aims to use contrast enhancement techniques [12] to enhance the image quality and to classify the citrus canker affected leaf by Support Vector Machine classification. This system which can provide more accurate results related to the identification and classification of disease. From an innovation perspective, the research contributions are as follows,

I. To enhance the quality and contrast of citrus leaf image by employing a Finite Dissimilar Compatible Histogram Leveling (FDCHL) enhancement techniques.

II. Presenting a framework for citrus canker diseases detection in citrus lemon leaf classification by implementing Support Vector Machine.

The paper, is organized in five Section II describes the related works. Section III describes the proposed methodology. Section IV represents results and discussion and the paper is concluded in section V

2.Related works

Ali et al., (2017), This paper presents a technique to detect and classify major citrus diseases of economic importance. Kinnow mandarin being 80% of Pakistan citrus industry was the main focus of study. Due to a little variation in symptoms of different plant diseases, the diagnosis requires the expert's opinion in diseases detection. The inappropriate diagnosis may lead to tremendous amount of economical loss for farmers in terms of inputs like pesticides. For many decades, computers have been used to provide automatic solutions instead of a manual diagnosis of plant diseases which is costly and error prone. The proposed method applied DE color difference algorithm to separate the disease affected area, further, color histogram and textural features were used to classify diseases.

Badnakhe et al., (2011), presents indirect contribution for the Improvement of the Crop Quality. It is a Machine learning based recognition system which will going to help in the Indian Economy. The paper will propose the technique to classify and identify the different disease affected plant. Digital Analysis of crop color is the important. Now it's becoming popular day by day. It is also of the cost effective method. Because changed in the color are a valuable indicator of crop health and efficiency and survaibility. Then it can be measured with visual scales and inexpensive crop color. This proposed work is giving of the better technique to do the classification of crop disease. We can easily develop an application. In future the experimental results indicate that the proposed approach is a valuable approach, which can significantly support an accurate detection of leaf, steam, and root diseases in a little computational effort.

Piyush et al., (2012), proposed an algorithm for disease spot segmentation using image processing techniques in plant leaf. Disease spots are different in color but not in intensity, in comparison with plant leaf color. So we color transform of RGB image can be used for better segmentation of disease spots. In this paper a comparison of the effect of CIELAB, HSI and YCbCr color space in the process of disease spot detection is done. Median filter is used for image smoothing. Finally, threshold can be calculated by applying Otsu method on color component to detect the disease spot. Experimental result shows that noise which is introduced because of background, vein and camera flash; can be wiped out using CIELAB color model.

Shaikh et al., (2018), discussed about a brief idea to solve this problem by continuously monitoring crops using „Agri-Robo" and techniques called Image Processing. Image Processing give the good solution to above crisis. Image processing gives fast, automatic and accurate solution to user. We developed an agri-robo system to monitor crops and for identifications and monitoring of diseases & pesticides. This agri-robo not only detects disease but also spray pesticides to protect them from disease. The robot helps the farmer to take informed decision locally or allows connecting with other existing services. This agri-robo find diseases on various infected leafs. This system result in detection of cotton diseases and spray the pesticides of disease in proper amount when needed.

3. Proposed Methodology

Image processing has play a terribly important role in agriculture field because of widely accustomed observe the crop disease with high accuracy. This paper focused mainly to improve the image quality with greater clarity by FDCHL enhancement techniques in pre-processing stages and to detect the canker disease by classifiers. The

following image processing techniques steps are used to detect the disease and Support Vector Machine are applied to get optimal solution of the canker disease are shown in fig. 2.

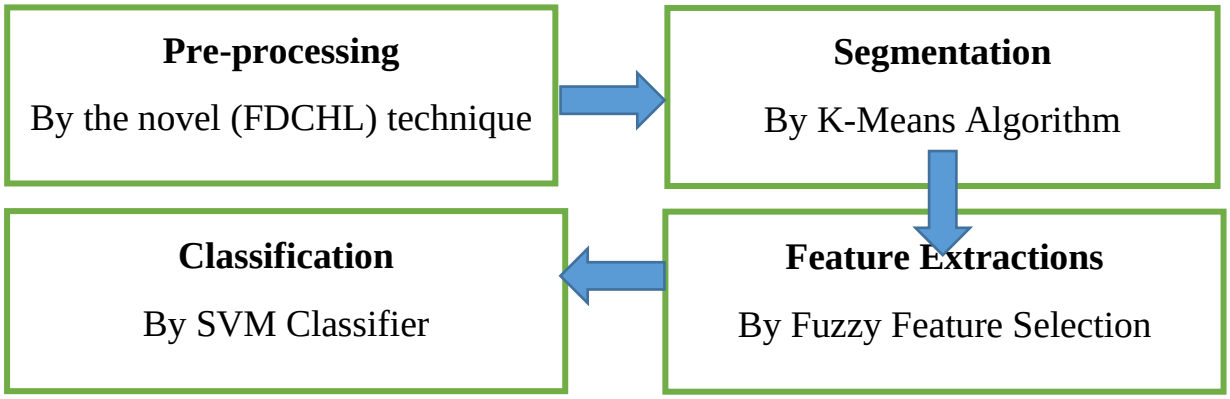

Fig. 2 System architecture for detection and classification of infected plant leaves

3.1. Collection of data

The data set were gathered using an advanced DSLR (Canon EOS 1300D) having a sensor with CMOS system and resolution of 5202-3465 (Mpix). The sensor size for Canon EOS 1300D is 14.9-22.3 (mm). RGB color range is chosen for each of the images in the JPG combination, including 256 shades for each RGB layer and 8 pixels for each shading layer.

3.2. FDCHL Pre-processing

The FDCHL to enhance the color images consists of the following steps:

Step 1: Dividing the intensity image into non overlapping contextual regions. Intensity components are partitioned into 8 x 8 non-overlapping contextual regions.

Step 2: Calculating the histogram of each region.

Step 3: Clipping the histogram of each region by the clip-limit value. The clipping rule is given by the following statements:

If H_{region} (i) > N_{clip} **then**

H_{region_clip} (i)=N_{clip}

Else if (H_{region} (i)+N_{avgbin}) > N_{clip} **then**

H_{region_clip} (i)=N_{clip}

Else H_{region_clip} (i) = (H_{region} (i)+N_{avgbin})

where H_{region} (i) is a local histogram of each region at i-th gray level. H_{region_clip} (i) represents clipped histogram of the region, N_{clip} denotes the actual clip-limit which is defined by

$N_{clip} = Min_{clip} + roundn(V_{clip} * (N_{pix} - Min_{clip}))$

where V_{clip} is clip-limit value in the range [0, 1] defined by the user. N_{pix} denotes the total number of pixels in the region. Min_{clip} is the minimum average of total pixels, N_{pix}, per total bins, N_{bin}, in the local histogram. Min_{clip} is defined by:

$$Min_{clip} = round(\frac{N_{pix}}{N_{bin}})$$

Thus, the total number of pixels, $N_{\Sigma clip}$, denotes the remain pixels from the clipped histogram. The average of the remain pixels to redistribute to each bin is calculated by

$$N_{avgbin} = \frac{N_{\Sigma clip}}{N_{bin}}$$

Step 4: Enhancing intensity values in each region. The clipped histogram, H_{region_clip}, is transformed to cumulative probability, P_{input} (x), which is provided to create transfer function. Rayleigh forward transform is given by

$$y = y_{min} + \sqrt{2\alpha^2 ln\left(\frac{1}{1 - P_{input}\ (x)}\right)}$$

where Y_{min} is the lower bound of the intensity value. α is a scaling parameter of Rayleigh distribution that is defined depending on each input image. The output probability density of each intensity value, Y, can be derived as

$$p(y) = \frac{y - y_{min}}{\alpha^2} exp\left(\frac{(y - y_{\min})^2}{2\alpha^2}\right) for\ y \geq\ y_{min}$$

Step 5: Reducing abruptly changing effect, the output from the transfer function is re-scaled using linear contrast stretch. The re-scale function still keeps the original shape of the transfer function to compress noise background and to design the color of output continuously. The linear contrast stretch is calculated by

$$y = \frac{x - x_{min}}{x_{max} - x_{min}}$$

where x is the input value from the transfer function, X_{min} and X_{max} denotes the minimum and maximum value of the transfer function.

Step 6: Interpolating by using bilinear of the neighboring sample points from the center pixel of contextual regions to form the enhanced in each region for the whole image as the new intensity, 1'. [7].

3.3. K-Means Clustering Procedure for Segmentation

Imagine a picture of resolution of x × y and the picture has to be congregate into k number of group.

Say p (x, y) be an input pixel to be cluster and C_k be the cluster centers. The algorithm is as following:

1. Initialize number of cluster k and centre.
2. For each pixel of an image, calculate the Euclidean distance d, between the center and each pixel of an image using the relation given below.

$d = \|p(x,y) - C_k\|$

3. Assign all the pixels to the nearest centre based on distance d.
4. After all pixels have been assigned, recalculate new position of the centre using the relation given below.

$$C_k == \frac{1}{k} \sum_{y \in C_k} \sum_{x \in C_k} p(x,y)$$

5. Repeat the process until it satisfies the tolerance or error value.
6. Reshape the cluster pixels into image.

3.4. Feature Extraction

3.4.1. Fuzzy curves

It is a nonlinear continues curve, which establishes a connection between a specific input and the output, performing a projection of the multidimensional input and output space on the probed input-output space [15]. For each date point, we can create a fuzzy membership function $\mu_{I,k}(x_i)$ using $\mu_{i,k}(x_i)$ from the fuzzy rule: IF x_i is $\mu_{I,k}(x_i)$ THEN y is y_k , that can be thought of as fuzzy rule for the output y with respect to each feature variable x_i ,

$$\mu_{i,k}(x_i) = \exp\ (-(\left(\frac{x_{i,k} - x_i}{\sigma_i}\right)^2)$$

each Gauss function is located at point ($x_{i,k}$, y_k) the parameter σ_i has a fixed value per feature variable, x_i which equals 5%∼20% of the x_i variable range. Using the centroid defuzzification technique, we defuzzify these fuzzy membership functions to produce a fuzzy curve c_i for each feature variable x_i by the following formula:

$$c_{i,k}(x_i) = \frac{\sum_{k=m}^{m} y_k \times \mu_{i,k}(x_i)}{\sum_{k=1}^{m} \mu_{i,k}(x_i)}$$

The above equation provides a continuous curve, which approximates the input output data, and behaves as a fuzzy model. The mean square error used to estimate the quality of the approximation,

$$MSE_{c_i} = \frac{1}{m} \sum_{k=1}^{m} \left(c_{i,k}(x_i) - y_k\right)^2$$

Using fuzzy curves, we can mechanically and rapidly identify the important features from the set of candidate features.

3.4.2. Fuzzy surfaces

The fuzzy surface is an extension of the fuzzy curve; it is based on the simple idea: Independent feature do a better job of approximating the output than dependent inputs [15]. Fuzzy surface can be thought of as a "two-dimensional" fuzzy curve. Fuzzy surface is defined as [16]:

$$s_{i,j}(x_i, x_j) = \frac{\sum_{k=1}^{m} y_k \times \mu_{i,k}(x_i) + \sum_{k=1}^{m} y_k \times \mu_{j,k}(x_j)}{2 \sum_{k=1}^{m} \mu_{i,k}(x_i) \times \mu_{j,k}(x_j)}$$

Where x_i and x_j are feature variables, $s_{i,j}(x_i, x_j)$ is a two-dimensional surface in feature space corresponding to a fuzzy rule:

IF x_i is $\mu_{i,k}(x_i)$ and x_j is $\mu_{j,k}(x_j)$, THEN y is y_k

As with fuzzy curves, the mean square error, MSE_{c_i} for the fuzzy surfaces is be used to evaluate the approximation of the input output data.

$$MSE_{S_{I,J}} = \frac{1}{m}\sum_{k=1}^{m}\left(s_{i,j}(x_i, x_j) - y_k\right)^2$$

3.4.3. Feature selection procedure of image

Using all spot features presented in the previous section as candidate features set. We choose 50 spots for each class disease leaf image, there are three classes disease leaf, the sample data are 150 (m=150). Output variable y_k is class label. We use the procedure to isolate the important and independent features [16]

1) Use fuzzy curves to rank all candidate features in order of significance- with in ascending MSE_{c_i} order.
2) Use the most important feature and each of other remaining features, chosen by the fuzzy curve, to create fuzzy surfaces, rank the features in order of dependence with the most important feature (in ascending MSE_s).
3) Use the second most important feature and each of remained features in previous step to create new fuzzy surfaces, once again.
4) Repeat fuzzy surfaces process until enough important inputs are obtained, or no remaining inputs are left.

3.5. Classification using Support Vector Machine (SVM)

The Support Vector Machine (SVM) classifiers are adopted differentiate citrus leaf disease. SVM is used to classify disease on their texture feature. The most attractive feature of the SVM is the maximum-margin hyper plane, the soft margin and the kernel function. For classifying any two linearly separable classes there may exist many separating lines that correctly classify the data. Among these lines the SVM select the line, which maximizes the distance between the separating hyper-planes. To explain it clearly we label the training data

$\{xi, yi\}$, $i = 1, \ldots\ldots, l$, $yi \in \{-1, 1\}$, $\mathbf{x}i \in \mathbf{R}d$

where l denotes the total no of training sample and d denotes the dimension of the feature vector. Suppose we have some hyper-plane, which separates the positive from the negative examples (a separating hyper-plane). The points $\boldsymbol{x}$ which lie on the hyper-plane satisfy

$\boldsymbol{w} \cdot \boldsymbol{x} + b = 0$,

where $\boldsymbol{w}$ is normal to the hyper-plane, $|b|/\|\boldsymbol{w}\|$ is the perpendicular distance from the hyper-plane to the origin, and $\|\boldsymbol{w}\|$ is the Euclidean norm of $\boldsymbol{w}$. Let $d+$ ($d-$) be the shortest distance from the separating hyper- lane to the closest positive (negative) instance. Define the "margin" of a separating hyper-plane to be $d+ + d-$. For the linearly separable case, the support vector algorithm simply looks for the separating hyper-plane with largest margin. This can be formulated as follows: suppose that all the training data satisfy the following constraints:

$\boldsymbol{x}i * \boldsymbol{w} + b = +1$ for $yi = +1$ (1)

$\boldsymbol{x}i * \boldsymbol{w} + b = -1$ for $yi = -1$ (2)

These can be combined into one set of inequalities:

$yi(\boldsymbol{x}i * \boldsymbol{w} + b) - 1 \geq 0 \; \forall i$ (3)

So, $d+ = d- = 1/\|\boldsymbol{w}\|$ and the margin is simply $2/\|\boldsymbol{w}\|$. Thus we can find the pair of hyper-planes, which gives the maximum margin by minimizing $\|\boldsymbol{w}\|2$, subject to constraint (3). Other important characteristic of the SVM is the soft margin that gives the user flexibility to choose the parameter to roughly control the number of examples. Another feature is the kernel function that projects the non-linearly separable data from low-dimensional space to a space of higher dimension so that they may become separable in the higher dimensional space too.

4. Experimental Results

We employ MATLAB in windows system to assess the performance of proposed methodology. Experiments are carried out on citrus (lemon) leaves to detect the canker disease. The experiment on the proposed methodology involves two phases firstly, the betterment of the quality of image is handled by applying the novel FDCHL pre-processing and then secondly, the process of detecting the canker disease in citrus is executed by adopting SVM classifier.

The performance of the proposed methodology is assessed through some specific metrics including Equal Error Rate, False Rejection Rate, False Acceptance Rate and Genuine Acceptance Rate by comparing it with different kind of classifier strategies such K-NN and Navies Bayes.

During the process of verification of the proposed system, the metric Equal Error Rate (EER) is considered to compute error rate in the operation of proposed system. On another hand, we measure the proposed system's both incorrect acceptance and incorrect rejection of canker leaves images through the metrics False Rejection Rate (FRR) and False Acceptance Rate respectively (FAR).

TABLE 1: Performance Comparison of Canker Detection

	Classifiers	FAR (%)	FRR (%)	GAR (%)	EER	Execution Time (ms)
Without FDCHL Pre-processing	KNN	3	2	97	0.72	0.64
	NB	4	4.5	96	0.62	0.57
	SVM	5	6	95	0.54	0.41
With FDCHL Pre-processing	KNN	4.7	4	95	0.39	0.30
	NB	5.3	6.7	94	0.33	0.21
	SVM	6.3	8.5	93	0.20	0.14

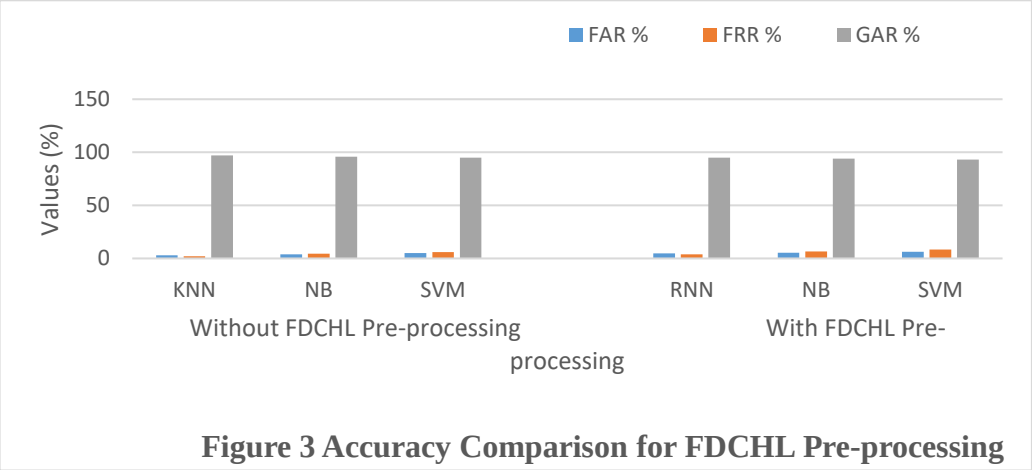

Figure 3 Accuracy Comparison for FDCHL Pre-processing

The above figure 3 shows Accuracy prediction of canker detection disease in citrus leaves in terms of FAR, FRR and GAR. It is clearly noted that the pre-processing step with FDCHL achieves efficient result integrated with SVM classifiers. The SVM classifiers achieves the good prediction rate for differentiating the canker disease.

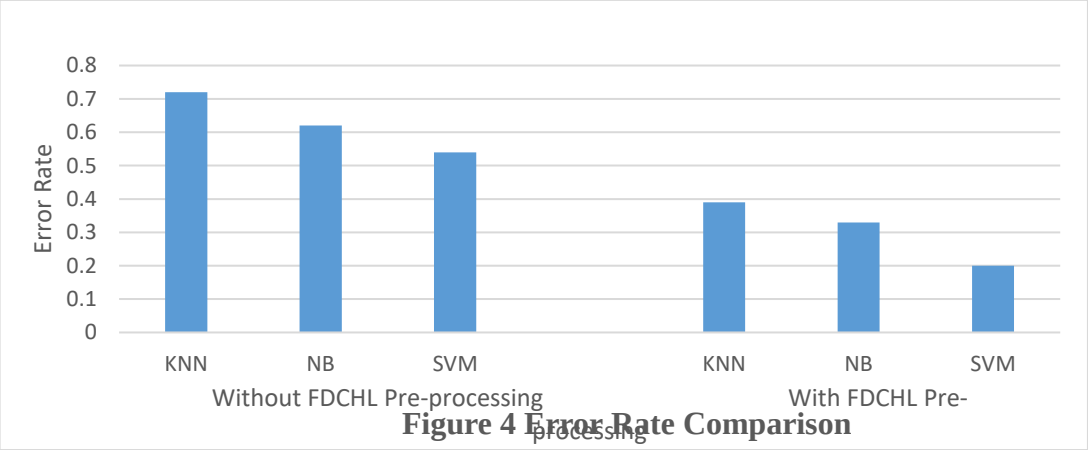

Figure 4 Error Rate Comparison

Figure 4 shows the Error rate comparison of various classifiers in terms of FDCHL Pre-processing. The SVM classifiers shows less error rate when compared to other classifiers.

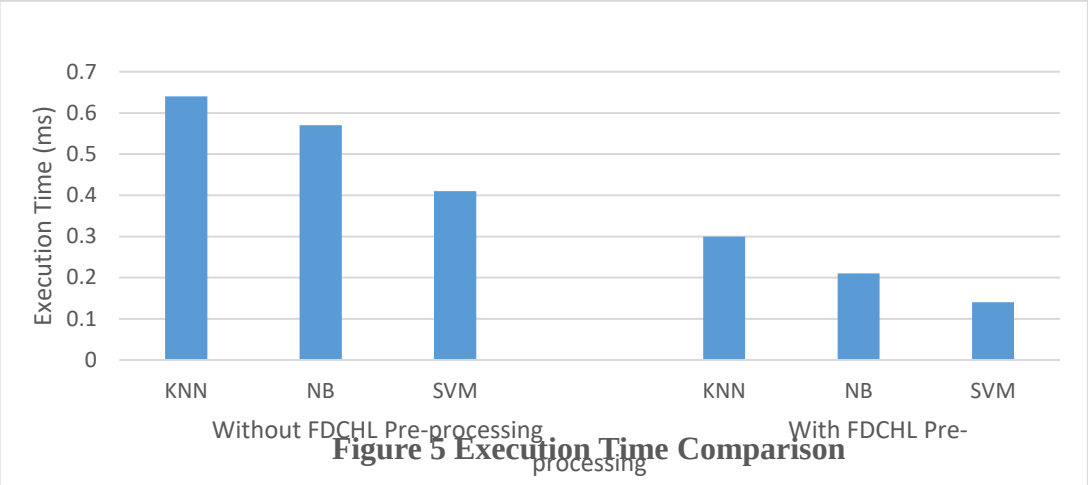

Figure 5 Execution Time Comparison

Figure 5 shows the Execution time comparison of various classifiers in terms of FDCHL Pre-processing. The SVM classifiers shows less execution time for detection of canker disease in citrus plant. Less execution and high accuracy will be the effective result for canker prediction.

5. Conclusion

Citrus is a vital plant grown mainly in the tropical areas of the world due to its richness in vitamin C and other important nutrients. Hence, this paper proposes an efficient methodology for detection of canker in citrus by applying FDCHL pre-processing to improve quality of image. First the sample leaves images are acquired and segmented into multiple parts. Then color and textures features are extracted and SVM classifiers are applied to detect the disease of the leaves. Experimental results express that our proposed enhancement methodology outperforms well in terms of image enhancement and the canker detection based classifiers achieves the efficient results of accurately detecting and differentiate the canker leaf disease.

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COMPARITIVE ANALYSIS ON SHORTEST PATH COMPUTATION IN GPS SYSTEMS

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Abstract: Distributed computing is a field of computer science that deals with the computation of distributed systems. The use of concurrent processes which was communicated by the process of message-passing has their own developments in operating system architectures. This paper discusses the results of monitoring, comparing and analyzing various algorithms which are used to find the shortest path between two locations in a GPS technology. The results are based on comparing various factors such as CPU utilization, CPU load, RAM utilization, network load, accuracy of the model and cross entropy value. The results are then discussed for various insights that are obtained over the course of this project.

Keywords:GPS,GlobalPositioningSystem

CPU,Centralprocessingunit

RAM,Randomaccessmemory

1. Introduction and Background Study

Distributed systems are by now very common, yet remains a difficult area of research. The results of new technologies coming up is that it's not only feasible, but easy, to hold together a computer system packed of multiple network computers, be they too large or too small. These computers are generally geographically dispersed, that reason they're usually said to make a distributed system. The size of a distributed system may vary from a couple of devices, to many computers. The interconnection network could also be wired, wireless, or a mixture of both. Moreover, distributed systems are often highly dynamic, within the sense that computers can join and leave, with the topology and performance of the underlying network almost continuously changing.

The Global Positioning System (GPS), firstly named as NAVSTAR GPS, is a satellite-based radio-navigation system which is owned by the US government and operated by the USSF (United States Space Force).GPS is a location based system which has 30 plus satellites surrounding the earth. GPS has mainly 3 components satellites, ground stations and a receiver. The satellites emit the signals continuously and the receiver in a device is constantly monitoring the result. The ground stations where made to make sure the correctness in satellites location by the use of radar. If a request is given from a device say X, the X calculates its distance to four or more satellites by figuring out how long it took for the signals to reach it. If the receiver knows its distance from four satellites it's easy to identify X's geolocation in co-ordinates. GPS apps are not only used by civilians but also by different organizations for different purposes. Different applications like Aviation, Marine, Farming, Science, Financial Services , Surveying, Military, , Telecommunications, Heavy Vehicle Guidance, Road Transportation, Social Activities, Locating Positions, GPS technology combined with Intelligence Vehicle Highway Systems is used to improve highway safety and ease congestion, Public Safety and Disaster Relief, Setting up a Geo-Fence etc.. . Out of which searching a location and finding the appropriate path is the commonly used application.

For finding the shortest ad appropriate path we have many algorithms like Dijkstra Algorithm, Breadth first algorithm, Depth first algorithm and A* heuristic algorithm.

2. PROBLEM STATEMENT AND OBJECTIVES

The problem definition of the context is to monitor, compare and analyse various algorithms based on shortest path finding in a GPS technology with different architectures under similar environment to provide insights regarding the performance and resource requirements by them.

The major objectives are as follows:

1. The objective of the paper was to determine which search method is suitable for implementation in GPS systems.
2. The properties of path finding algorithms were tested and discussed taking into account this type of systems. 3. Compare and analyse various results obtained as part of the testing and the results obtained by monitoring the system environment.

3. CONCEPTS & METHODOLOGY

The shortest path problem is about finding a path between two vertices in a graph such that the total sum of the edges weights is minimum. The problem of finding the shortest path between two intersections on a road map may be modelled as a special case of the shortest path problem in graphs, where the vertices correspond to intersections and the edges correspond to road segments, each weighted by the length of the segment. Shortest path algorithms are applied to automatically find directions between physical locations, such as driving directions on web mapping websites like MapQuest or Google Maps.

For this application fast specialized algorithms are available. If one represents a nondeterministic abstract machine as a graph where vertices describe states and edges describe possible transitions, shortest path algorithms can be used to find an optimal sequence of choices to reach a certain goal state, or to establish lower bounds on the time needed to reach a given state. For example, if vertices represent the states of a puzzle like a Rubik's Cube and each directed edge corresponds to a single move or turn, shortest path algorithms can be used to find a solution that uses the minimum possible number of moves. In a networking or telecommunications mind-set, this shortest path problem is sometimes called the min-delay path problem and usually tied with a widest path problem. For example, the algorithm may seek the shortest (min-delay) widest path, or widest shortest (min-delay) path.

A more light-hearted application is the games of "six degrees of separation" that try to find the shortest path in graphs like movie stars appearing in the same film. Other applications, often studied in operations research, include plant and facility layout, robotics, transportation, and VLSI design

3.1. SHORTEST PATH ALGORITHMS USED

There are n numbers of algorithms available for computing the shortest path problem. In this study we compare mainly 4 types of algorithms.

3.1.1 A* ALGORITHM

A* (pronounced "A-star") is a graph traversal and path search algorithm, which is often used in computer science due to its completeness, optimality, and optimal efficiency. One major practical drawback is its space complexity, as it stores all generated nodes in memory. Thus, in practical travel-routing systems, it is generally outperformed by algorithms which can pre-process the graph to attain better performance, as well as memory-bounded approaches; however, A* is still the best solution in many cases. A* was originally designed for finding least-cost paths when the cost of a path is the sum of its edge costs, but it has been shown that A* can be used to find optimal paths for any problem satisfying the conditions of a cost algebra. A* is an informed 21 search algorithm, or a best-first search, meaning that it is formulated in terms of weighted graphs: starting from a specific starting node of a graph, it aims to find a path to the given goal node having the smallest cost (least distance travelled, shortest time, etc.). It does this by maintaining a tree of paths originating at the start node and extending those paths one edge at a time until its termination criterion is satisfied

3.1.2 DIJKSTRA ALGORITHM

Dijkstra algorithm (or Dijkstra Shortest Path First algorithm, SPF algorithm) is an algorithm for finding the shortest paths between nodes in a graph, which may represent, for example, road networks. It was conceived by computer scientist Edger W. Dijkstra in 1956 and published three years later. The algorithm exists in many variants. Dijkstra original algorithm found the shortest path between two given nodes, but a more common variant fixes a single node as the "source" node and finds shortest paths from the source to all other nodes in the graph, producing a shortest-path tree. For a given source node in the graph, the algorithm finds the shortest path between that node and every other. It can also be used for finding the shortest paths from a single node to a single destination node by stopping the algorithm once the shortest path to the destination node has been determined. For example, if the nodes of the graph represent cities and edge path costs represent driving distances between pairs of cities connected by a direct road (for simplicity, ignore red lights, stop signs, toll roads and other obstructions), Dijkstra algorithm can be used to find the shortest route between one city and all other cities. A widely used application of shortest path algorithm is network routing protocols, most notably IS-IS (Intermediate System to Intermediate System) and Open Shortest Path First (OSPF). It is also employed as a subroutine in other algorithms such as Johnson's.

3.1.3 BREADTH FIRST SEARCH ALGORITHM

Breadth-first search (BFS) is an algorithm for traversing or searching tree or graph data structures. It starts at the tree root (or some arbitrary node of a graph, sometimes referred to as a 'search key'), and explores all of the neighbour nodes at the present depth prior to moving on to the nodes at the next depth level. It uses the opposite strategy as depth-first search, which instead explores the node branch as far as possible before being forced to backtrack and expand other nodes. BFS and its application in finding connected components of graphs were invented in 1945 by Conrad Zeus, in his (rejected) Ph.D. thesis on the Plankalkül programming language, but this was not published until 1972. It was reinvented in 1959 by Edward F. Moore, who used it to find the shortest path out of a maze, and later developed, by C. Y. Lee into a wire routing algorithm (published 1961).

3.1.4 DEPTH FIRST SEARCH ALGORITHM

Depth-first search (DFS) is an algorithm for traversing or searching tree or graph data structures. The algorithm starts at the root node (selecting some arbitrary node as the root node in the case of a graph) and explores as far as possible along each branch before backtracking. A version of depth-first search was investigated in the 19th century by French mathematician Charles Pierre Trémaux as a strategy for solving mazes. The time and space analysis of DFS differs according to its application area. In theoretical computer science, DFS is typically used to traverse an entire graph. For applications of DFS in relation to specific domains, such as searching for solutions in artificial intelligence or web-crawling, the graph to be traversed is often either too large to visit in its entirety or infinite (DFS may suffer

from nonterminating). In such cases, search is only performed to a limited depth; due to limited resources, such as memory or disk space, one typically does not use data structures to keep track of the set of all previously visited vertices.

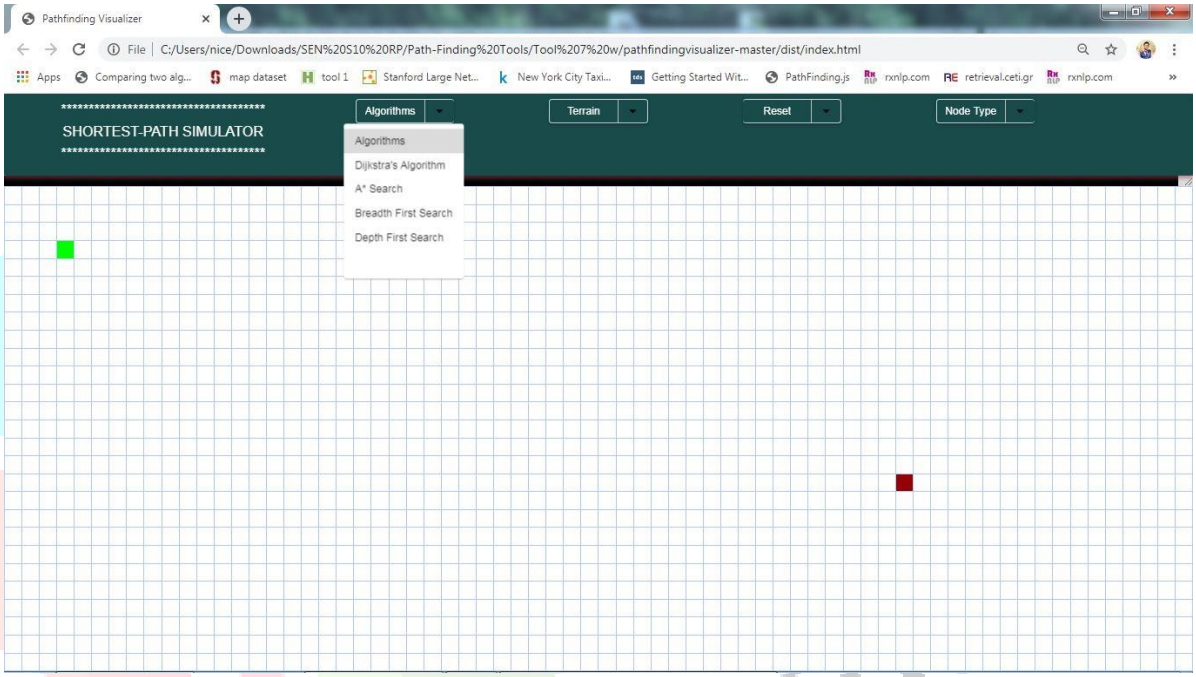
4. TOOLS AND PLATFORM USED

Platform used for the project is a shortest path computing visualizer with JavaScript libraries.
Various architectures used during the comparative study are listed below.
1. Shortest-path Simulator
2. JavaScript
3. React js.

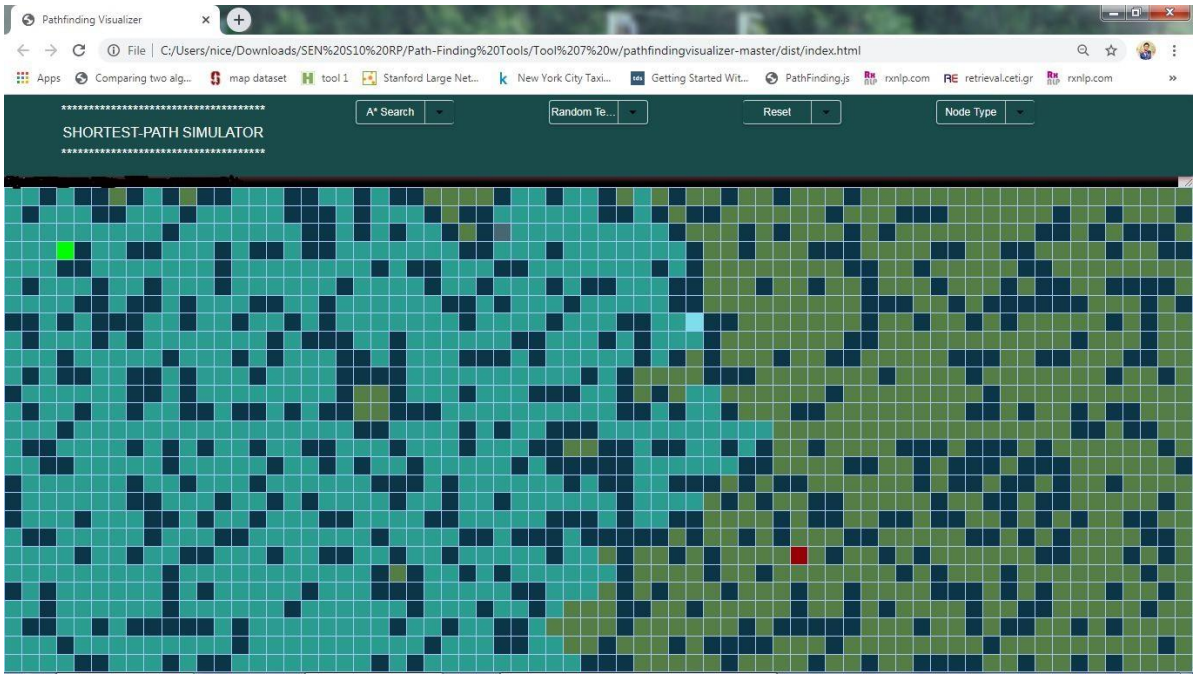
5. EXPERIMENT IMPLEMENTATION

The experimentation system was created in order to properly investigate the properties of the path finding algorithms. It contains the programmed simulator with the four implemented algorithms and three different terrain patterns.

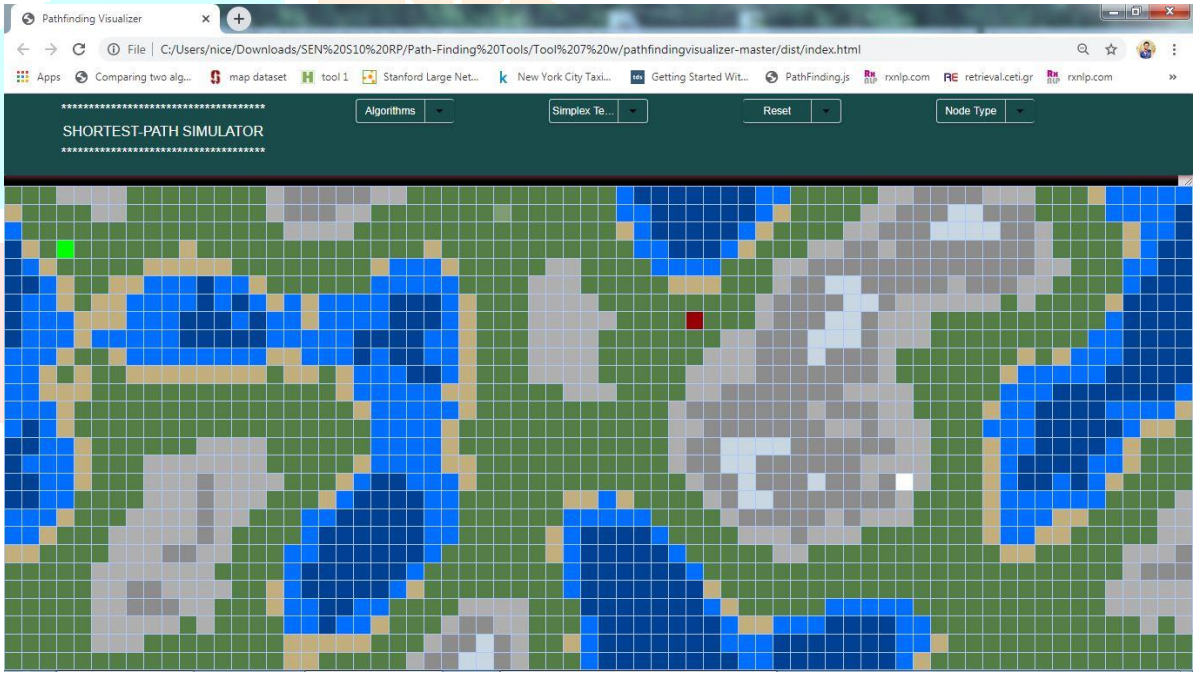
5.1. Normal Terrain



5.2. Random Terrain



5.3. Recursive Terrain



6. RESULTS

The results obtained during the simulation process of finding the shortest path between the source node and destination node are provided in this section. The results are in terms of final test accuracy, total number of Nodes visited, total Time taken for completing the process, total path Cost, CPU utilization, CPU load, memory utilization and network traffic. All of the above mentioned parameters has been measured for all four algorithms which are A*, Dijkstra, Breadth First and Depth First algorithms.

6.1 TEST ACCURACY USING SIMULATOR

The final test accuracy value is the taken according to the results obtained during the simulation process under multiple circumstances. The final value taken when multiple parameters like number of nodes visited, time taken and path cost. This value are significant because it represents the accuracy or in other words rate of successful shortest-path finding process. The following figures represent the final test results of the various algorithms. Each algorithm will have 3 different test accuracy results according to the different terrains.

6.1.1NORMALTERRAIN

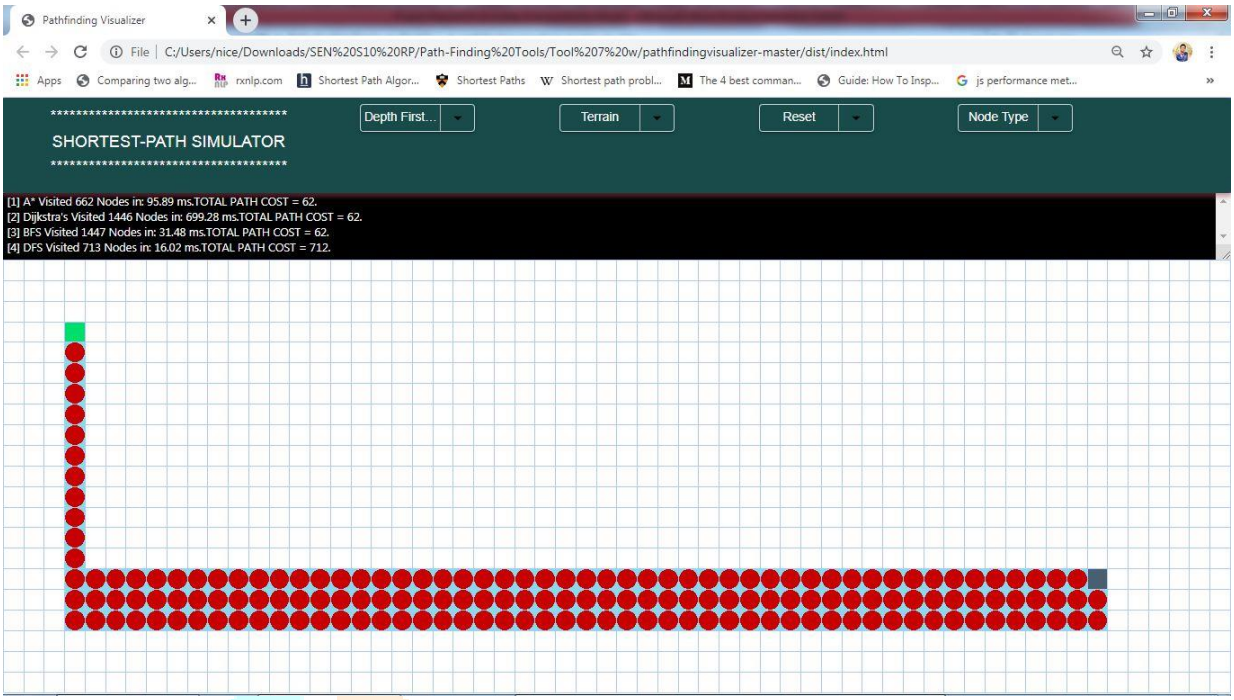


Figure 6.*1*.1: RESULT *SET OF ALL ALGORITHMS UNDER NORAML TERRAIN CONDITION.*

6.1.2 RECURSIVE TERRAIN

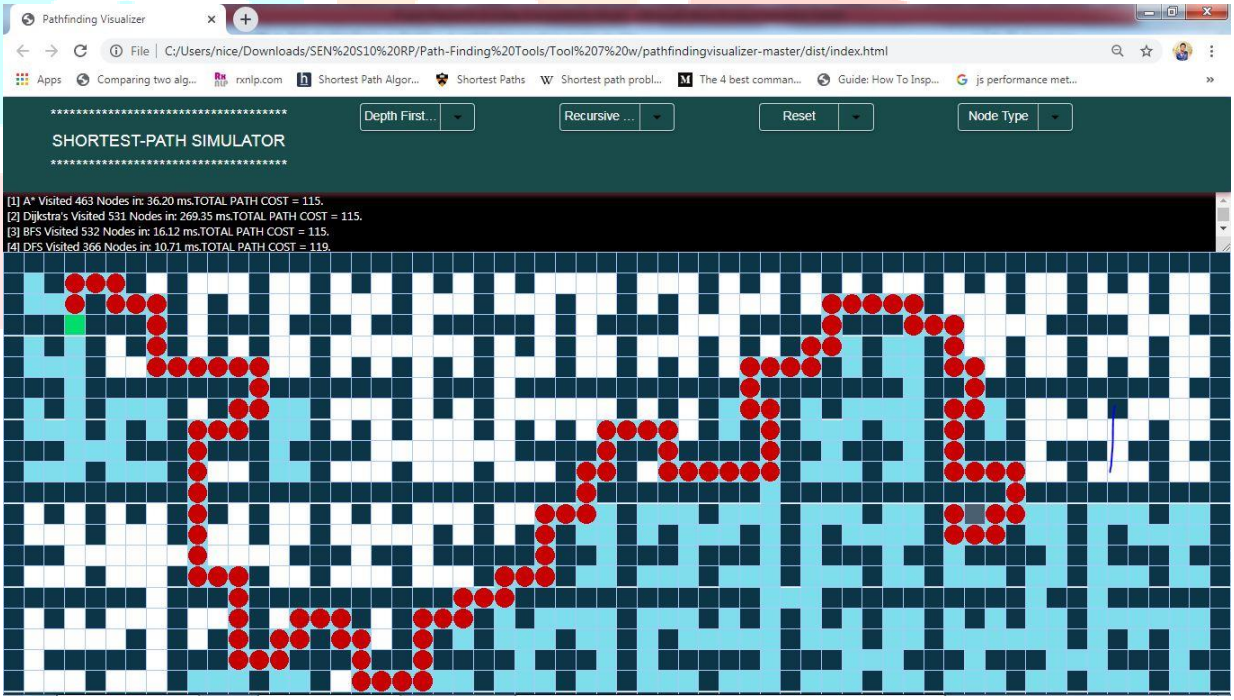


Figure 6.12: RESULT *SET OF ALL ALGORITHMS UNDER RECURSIVE TERRAIN CONDITION.*

6.1.3 RANDOM TERRAIN

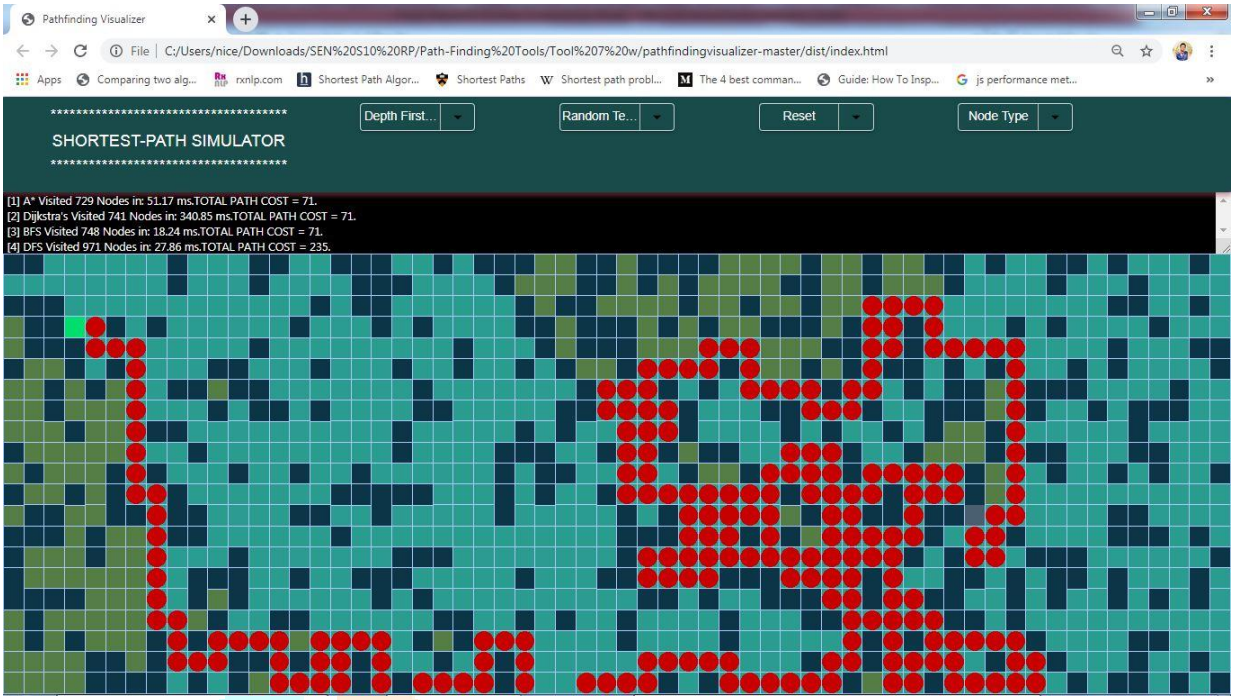


Figure 6.13: RESULT *SET OF ALL ALGORITHMS UNDER RANDOM TERRAIN CONDITION.*

6.2 CPU UTILIZATION AND MEMORY USAGE

6.2.1 A* ALGORITHM

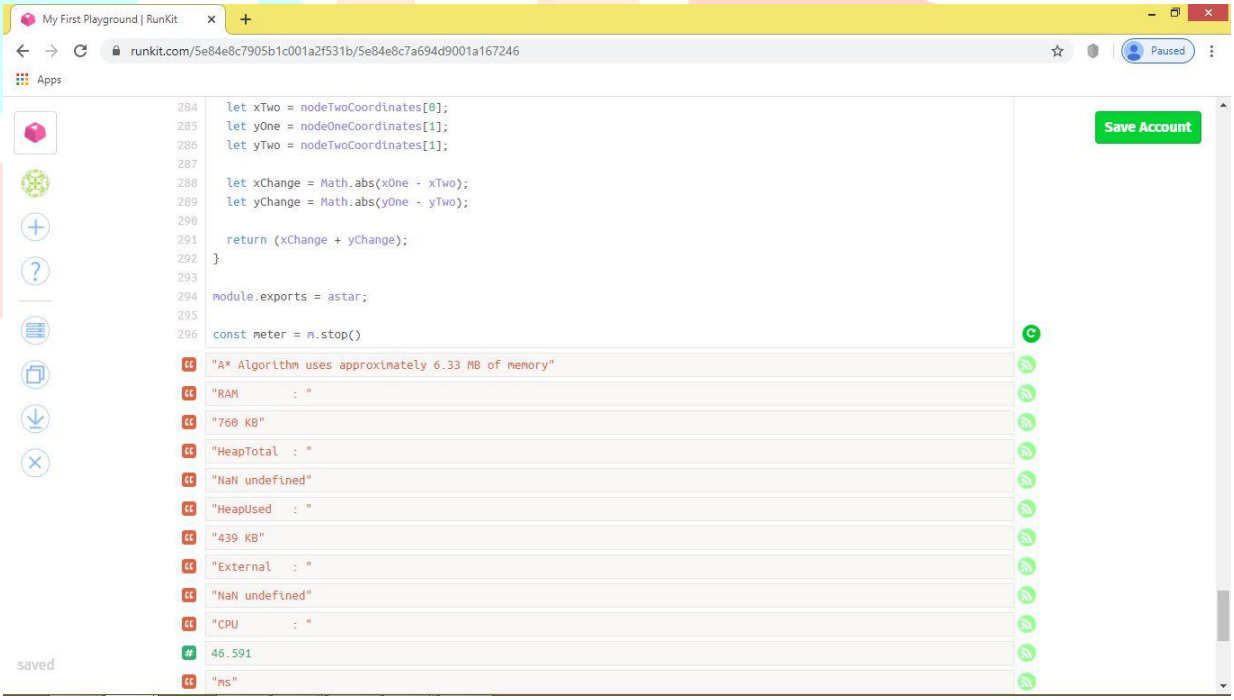


Figure **6.2.1: CPU** *USAGE OF A* CODE.*

6.2.2 DIJKSTRA ALGORITHM

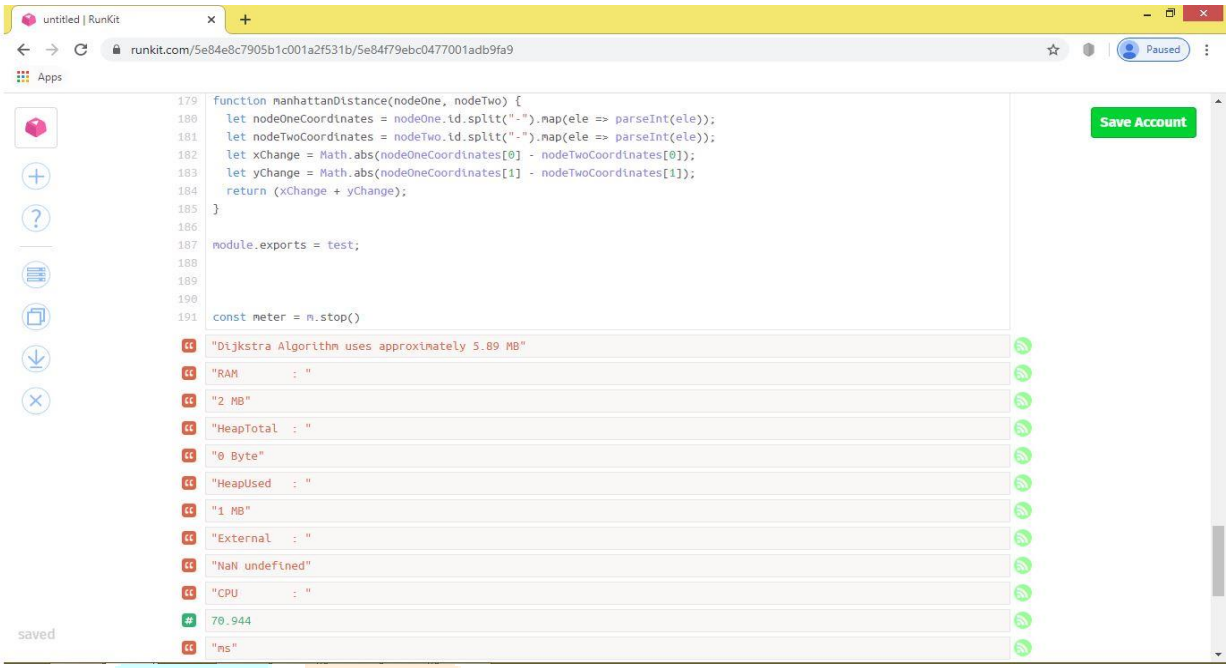


Figure **6.2.2: CPU** *USAGE OF DIJKSTRA CODE.*

6.2.3 BREADTH FIRST SEARCH ALGORITHM

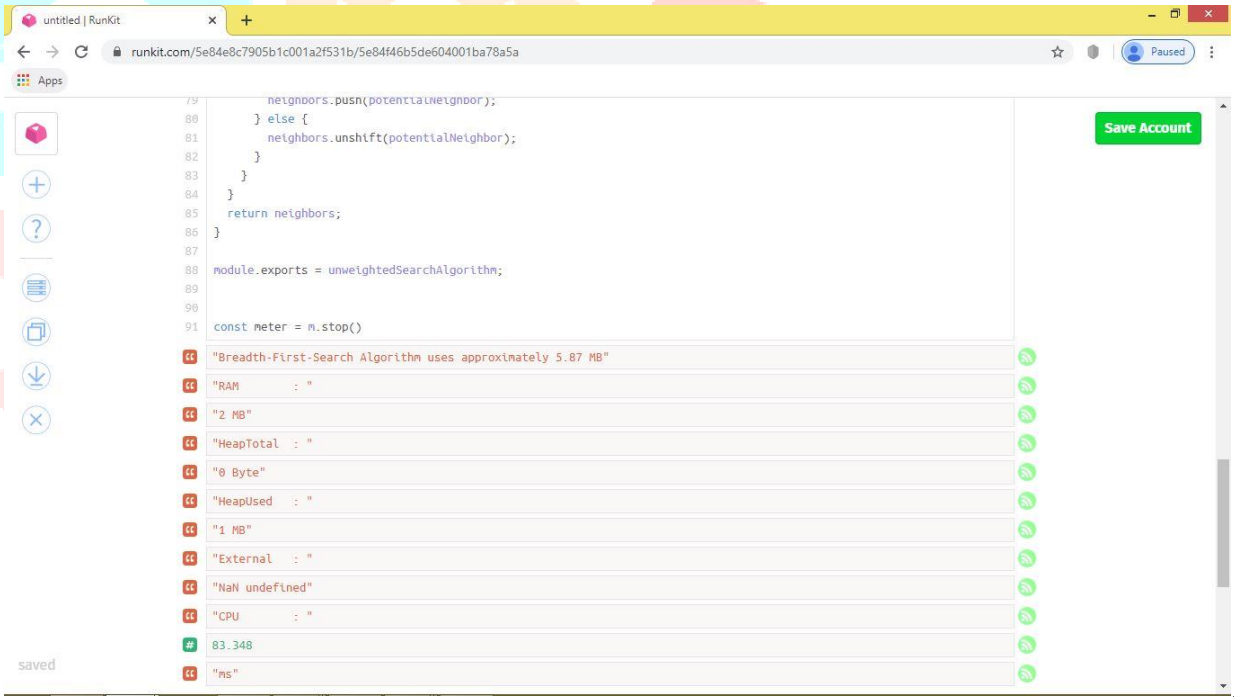


Figure **6.2.3: CPU** *USAGE OF BFS CODE.*

6.2.4 *DEPTH FIRST SEARCH ALGORITHM*

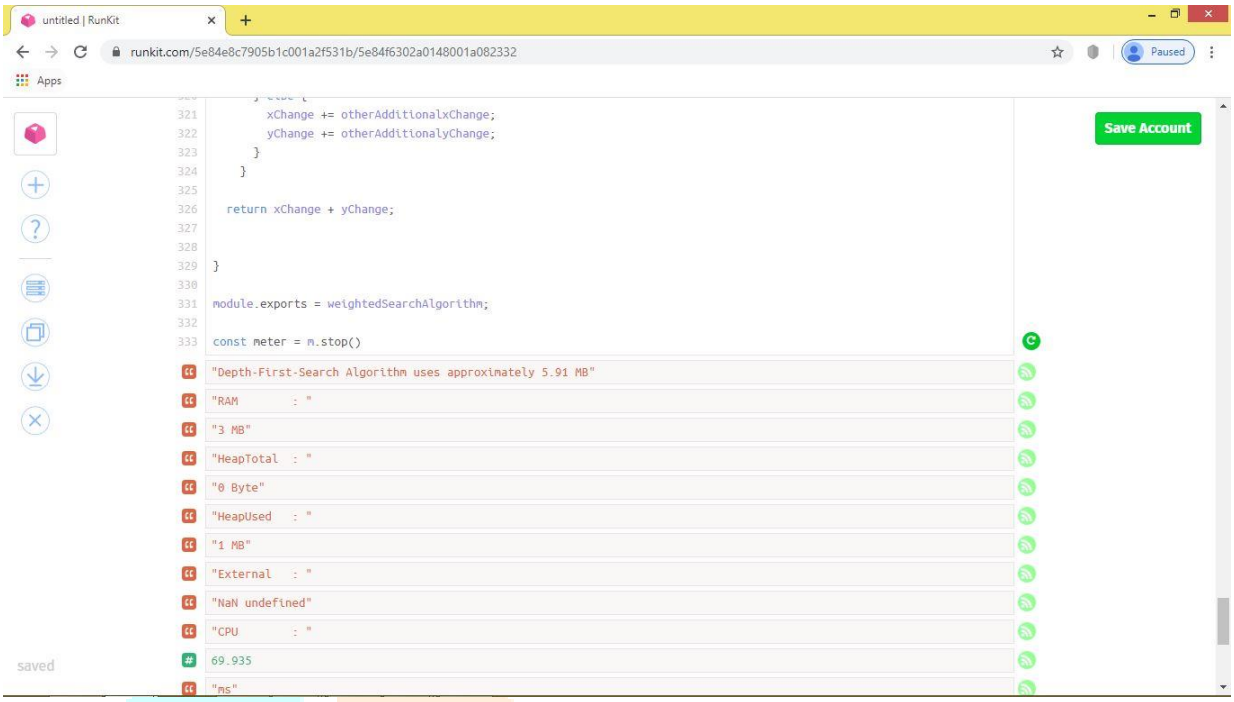


Figure **6.2.4: CPU** *USAGE OF DFS CODE*

6.3 TABULATED SUMMARY OF RESULTS

ALGORITHMS USED	TERRAIN USED	TOTAL PATH COST	TOTAL TIME TAKEN (in ms)	NO:OF NODES VISITED	TOTAL MEMORY USED (in Mb)	RAM USED (in Mb)	HEAP USED (in Kb)	CPU USAGE (in ms)
A* ALGORITHM	NORMAL	62	95.89	662	6.33	0.74	440	46.59
	RECURSIVE	115	36.20	463				
	RANDOM	71	51.17	729				
DIJKSTRA ALGORITHM	NORMAL	62	699.28	1146	5.89	2.0	1024	70.94
	RECURSIVE	115	269.35	531				
	RANDOM	71	340.85	741				
BFS ALGORITHM	NORMAL	62	31.48	1447	5.89	2.0	1024	83.35
	RECURSIVE	115	16.12	532				
	RANDOM	71	18.24	748				
DFS ALGORITHM	NORMAL	712	16.02	713	5.91	3.0	1024	71.34
	RECURSIVE	119	10.71	366				
	RANDOM	235	27.86	971				

Table 6.3: SUMMARISED RESULTS OF ALL FOUR ALGORITHMS IN A TABLURISED FORAMT.

7. FINAL VERDICT

7.1. DISCUSSIONS

The objective of this project was to analyse and compare the various shortest path algorithms in terms of their performance and complexity. The expected results of this project are to find the best algorithm that can be used for shortest path finding problem especially on a GPS system on the basis of their performance. But during the course of this project, the results obtained provided with new insights to these algorithms performance. We used mainly two platforms to bring out the best algorithm. One of them is the simulator and the other is the node js-meter. With the simulator we got the results and from those results we have calculated the average for the purpose of better graphical experience.

7.2. CONCLUSION

In this project we compared all this four algorithms fewer than seven main factors that are path cost, time taken, number of nodes visited, total memory used, RAM used, heap used and cup usage. This factors are can be prioritized like total path cost, time taken, total memory, RAM usage, cup usage, heap used and the least prioritized number of nodes visited. When we were examining the path cost factor we have observed that all the three algorithms that is Dijkstra, A*, BFS algorithms have been very efficient in finding the least cost path whereas DFS was unable to do so. So with total time taken factor Dijkstra algorithm used 19 times more seconds than BFS,A* took 3 times more than BFS, making BFS a time-friendly algorithm. When it comes to memory usage and RAM usage A* took the most out of it and rest three algorithms took less memory for usage. With the CPU usage the BFS took almost 85-90% of it whereas A* and Dijkstra were good enough. So for the concluding points, Dijkstra is known as Grand-Father of shortest-path finding algorithms as it is 64 years old but still Dijkstra managed to do well with all algorithms. BFS and DFS being good at only some un-prioritized factors needs not be considered, but the time it is taking very less than any of them. A* on the other hand does a decent job in almost all factors. So any combinations of A*, Dijkstra and BFS would benefit the process of finding the shortest path between two nodes in a shortest time.

7.3. SCOPE FOR FUTURE WORK

Searching is the problem-solving technique in computer science field. Almost all application is using Dijkstra till now. As technology grows, the speed of vehicles also increased like rocket. That is why a scholar as well as Microsoft, Google like companies starts working on A* algorithm because A* performance is better than Dijkstra. At present time, even one second has also weightage for Light motor vehicles because of its very high speed. But the major disadvantages with A* algorithm is that it takes a huge amount memory as it stores all its nodes to memory .So as both algorithms having their own dis-advantages the scope for future work is high. A study on solving this problem could also lead to new algorithms being generated from these two algorithms which can be used in all applications of computer science like computer networks, road networks and all location based services.

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CONSUMER BEHAVIOR TRENDS DURING COVID-19 PANDEMIC

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***Abstract*: Online shopping enables the consumers to purchase products or services from various sellers with the help of internet using web browser or a web application. Consumer Behavior is a difficult and inspiring field to analyze as preferences vary over a period of time. During Covid-19 pandemic The temporary closure of various restaurants and related establishments, consumers spending more on grocery purchase during the COVID-19 pandemic. Grocery shopping is one of the essential activity .With an intention to make aware the variability in the consumer behavior of grocery shopping under different scenarios of the COVID-19 pandemic, we conducted an online formulated experiment to draw out the preferences for purchasing methods, product requirements, time windows, minimum order necessity, and delivery charge. Using various choice decisions from a sample of 100 grocery shoppers in India, we conclude that the trend in the COVID-19 pandemic produce significant differences in grocery shopping inclinations. To maintain isolation, nowadays consumers preferring digital medium to connect, learn and work and they will continue to.**

***Keywords*: Covid 19, Online shopping, Purchasing decisions**

INTRODUCTION

The novel corona virus disease (COVID-19) has affected the day today life of many People. In an endeavor to limit the virus spread of COVID-19, people have changed their shopping behavior. According to the recent study, various expenses like on air travel, grocery delivery, entertainment and other categories changed substantially from week to week during the period of COVID-19 pandemic [1]. In the India, lot of people consumed food from restaurants under normal circumstances .However, during the pandemic; groceries are one of the basic human necessities. In fact, consumer expenditure on groceries and related items increased in every aspect. India has been under lockdown since March 25 in an effort to decrease the spread of Novel corona virus. The police department has imposed various types of the restrictions on movements. While understanding a significant impact of the two outbreaks on consumer behavior and expenditure, neither study considered the roles of purchasing methods, time windows, minimum order requirements, and fees. We thus contribute to the scarce literature with evidence of consumer preferences for these grocery shopping attributes under various scenarios of the COVID-19 pandemic. Our novel findings inform numerous recommendations for academics, practitioners, and retailers during the COVID-19 pandemic.

EXPERIMENTAL DESIGN AND METHODOLOGY

To find out the consumer behavior towards on online shopping in India, we have been carried out a detailed study through a survey by forming a brief set of questionnaire. Considering the research factor, A set of questions in three -point scale ranging from strongly agree to strongly disagree been used to collect an easy response from various category of people. The importance of this type of study is based on an assumption that there is a significant change in consumers behavior toward online shopping, most of them are demand to remain post-pandemic situation also. The covid 19 outbreak has not only refashioning the way customer's view in personal and health care routines but also the way they mingle with friends, relatives and communities. Isolation leads human to cuddle technology and gadgets more than ever. The way people are put in their free time is also becoming more reliant on technology. This adaption of technology is expect to continue post-Covid situation as well.

LITERATURE REVIEW

Considering the recent studies on online shopping we include the following four product attributes with their status:

Purchasing Pattern: Generally, there are three alternative methods to self-service grocery shopping inside the store. (1) In-store pick-up: The consumer goes inside the store and collects the ordered groceries.(2) Take out service : The customer waits inside his/her car outside the store and store keeper Places the ordered items in the vehicle. (3) Home delivery: delivery person delivers the ordered Groceries to the home of the customer.

Time frame: While placing the order through online applications, customers may pick or indicate a favored time for delivery window to collect the groceries. Based on information from various vendors as we considered four levels: (1) Less than 4 h, (2) between 4 and 12 h, (3) next day delivery (4) delivery within a week.

Minimum Order Requirement: Online customers are forced to meet a minimum order requirement to make transactions. Again, based on information from various vendors we taken into account some levels.

Delivery charge. If the purchasing method is home delivery some amount of delivery charges may be taken by the vendor.

FACTORS AFFECTING ONLINE SHOPPING BEHAVIOR OF THE CUSTOMER

Since online shopping is still a fairly new experience for the customers and vendor, respondents were asked to list their most important reasons for using the Internet to buy groceries. Questionnaire is setting up in such a way that customers can give their onion in an easy way In order to study the factors affecting online shopping behavior of customers; the exploratory factor analysis has been employed. The principal component method of factor analysis has been carried out with Eigen values greater than one through varimax rotation and the results obtained through rotated component matrix. The consumers who make online shopping in our country is collected using survey and after identifying them, primary data were collected from 188 consumers in Ernakulum district and 224 consumers from Trivandrum district. Thus, a total of 412 consumers constituted as the core respondents from the top two districts in Kerala are taken in to account for this study.

Table 1: factors affecting online shopping behavior of consumers

Factor	Item	Rotated Factor Loadings	Eigen Value	% of Variation	Factor Name
1	I can buy the products anytime 24 hours a day while shopping online	**.67**	**2.123**	**23.75**	**Convenience**
	Detail information is available while shopping online	**.63**			
	It is easy to choose and make comparison with other products while shopping online	**.65**			
	Finding right product online is easy	**.61**			
	I get on-time delivery by shopping on-line	**.58**			
2	The website layout helps me in searching and selecting the right product while shopping online	**.65**	**1.43**	**19.45**	**Website Features**
	The website design helps me in searching the products easily	**.58**			
	I prefer to purchase from a website that provides safety and ease of navigation and order	**.54**			
	I prefer to buy from website that provides me with quality of information	**.49**			
3	Online Shopping protects my security	**.65**	**1.17**	**16.2**	**Security**
	online Shopping protects my security	**.64**			
	I like to shop online from a trustworthy website	**.68**			
4	It takes less time in evaluating and selecting a product while shopping online	**.59**	**1.04**	**11.90**	**Time Saving**
	Online shopping takes less time to purchase	**.55**			
	Online shopping doesn't waste time	**.56**			
	Cumulative % of Variation			**71.6**	

INFLUENCE OF FACTORS AFFECTING ON PURCHASING DECISION

In order to examine the influence of factors affecting online shopping behavior on purchasing decision of consumers, the multiple linear regressions has been applied and the results are presented in Table 2. The factors affecting online shopping behavior are considered as independent variables and the purchasing decision is considered as dependent variable. The results show that the coefficient of multiple determinations (R2) is 0.66 and adjusted R2 is 0.64 indicating the regression

Model is good fit. It is inferred that about 64.00 per cent of the variation in dependent variable (Purchasing Decision) is explained by the independent variables (Factors Affecting Online Shopping Behavior). The F-value of 13.827 is statistically significant at one per cent level indicating that the model is significant

Table 3: Influence of Factors Affecting Online Shopping Behavior on Purchasing Decision of Consumers

Factors Affecting Online Shopping Behavior	Regression Co-efficient	t-value	Sig.
Convenience	.54	8.5	.00
Website Features	.53	8.4	.00
Security	.45	8.2	.00
Time saving	.47	8.4	.00
R^2	.65	-	
Adjusted R^2	.33	-	0
F	13	-	
N	298	-	

The results shown in the table indicate that convenience, security, website features and time saving are positively and significantly influencing the purchasing decision of consumers at one per cent level. Hence, the null hypothesis of there is no significant influence of factors affecting online shopping behavior on purchasing decision of consumers is rejected. Convenience and Security is two main considerations during the current pandemic situation.

FINDINGS & RESULTS

Majority of the survey respondents are in the age group of 25-35 years. Most of the respondents are employees and they earn a pay of Rs30000- Rs 80000. The chi-square analysis proves that the factors that allow us to get knowledge about the online shopping for number of years, Educational qualification, Job environment decides the frequency of online purchases and preferred mode of payment have an association with the awareness and knowledge towards online shopping. There is no direct and significant relationship between monthly income, Occupation and the level of satisfaction of the respondents towards Online Shopping. The product dimensions considered are positively correlated with satisfaction towards Online Shopping. During covid Pandemic the consumer behavior changes a lot due to security and convenience is main consideration So the frequency of online shopping is increased in a very high rate in the last 6 months and the expectation is that the same trend will be continuing hereafter.

CONCLUSION

The online shopping consumers at Kerala in both Ernakulum and Trivandrum are satisfied with the online shopping process. They are benefited with various facilities like convenience, less procedure, timely delivery, safety during covid pandemic, product offers, low cost, convenience etc. The product dimensions are identified to be highly satisfied and highly correlated. The understanding of the nature, needs and wants of the consumers as such in other business is very much vital for the study.

SCOPE FOR FURTHER RESEARCH

- The current study of consumer behavior during pandemic considers only the online based product features .Further research can be done on website features.
- This study can be conducted specifically by considering a product or a company

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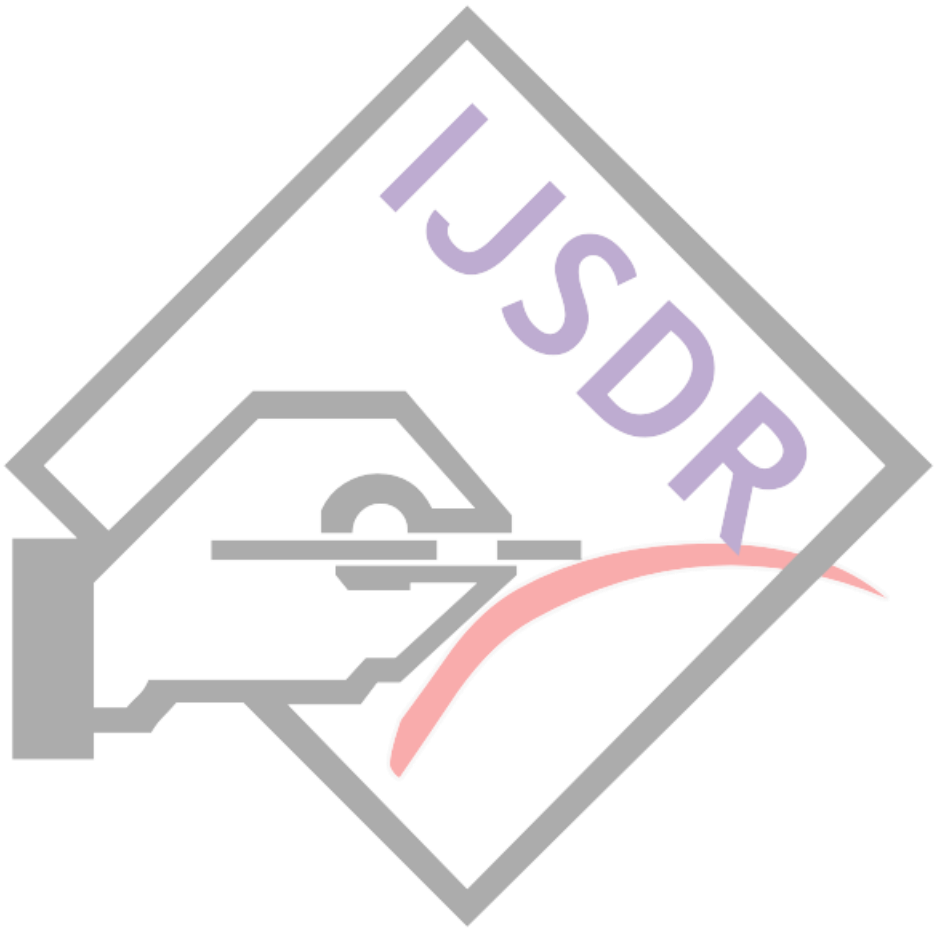

CSR SPENDING AND THE PERFORMANCE OF THE TOP CSR CONTRIBUTING COMPANIES: AN ANALYSIS BASED ON FINANCIAL PARAMETERS*

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ABSTRACT

In the present era, Corporate Social Responsibility (CSR) has become important to such an extent that it has been often used as a yardstick by the investors for measuring the performance of the stock. Indian corporate sector nowadays is willing to spend huge amount of money in order to sustain their goodwill before their stakeholders. The amendment of The Companies Act 2013, has made it mandatory for the companies to take up socially relevant CSR activities which have made India, the only nation which has regulated and mandated CSR. This initiative has helped the nation move towards achievement of Sustainable Development Goals (SDGs) and is eventually evolving as an important contributor towards government spending. As per National CSR Data portal, the total number of registered CSR companies comes to 19,933 and the total contributions made by them is 13,465 crores (Rs.) for the Financial Year (FY) 2016-17. This paper focuses on finding the impact of CSR spending on the performance of the top 10 companies based on their CSR spending for the last 10 years. The variables used for the study are Goodwill, Environmental Social and Governance (ESG) Disclosure scores, Enterprise Value (EV), Beta and share prices.

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KEYWORDS

Corporate Social Responsibility, Government spending, Enterprise Value.

Introduction

Management and Society is a mutually dependent term which has broad classifications. One interlinking factor between both this concept is Corporate Social Responsibility (CSR). CSR refers to the company's efforts to improve the society by donating money as well as services to non-profit organizations for implementing environment friendly policies in the workplace. It is very important for the companies, non-profits, and employees of an organization to contribute towards the society, environment, country, and so on. CSR has a major role on the performance of the company. Businesses which focus to continue serving the society and its stakeholders contribute a portion of their profits as CSR every year. Companies Act 2013 mandates that companies with a net worth of more than 500 crores or revenue of more than 1,000 crores or net profit of more than 5 crores must spend at least 2% of their average net profit of the preceding three years on CSR activities.

Tata Group of Companies is well known in the market for their contributions to the society through CSR spending. The Tata group spends about 1,000 crores annually on its CSR work and even has a dedicated unit, Tata Sustainability Group, which addresses key environmental issues related to water, carbon and waste.

Companies nowadays concentrate more on their CSR spending not only to abide by the law but also to participate in the development process of the economy. As per National CSR Data portal, the total number of registered CSR companies comes to 19,933 and the total contributions made by them is 13,465 crores (Rs.) for the Financial Year (FY) 2016-17.

This paper focuses on finding the impact of CSR spending on the performance of the top 10 companies based on their CSR spending for the last 10 years. The companies were chosen based on their CSR spending during the financial year 2016-17. The study is on finding the contributing factors which impact the growth of CSR spending made by the companies. The variables used for the study are Goodwill, Environmental Social and Governance (ESG) Disclosure scores, Enterprise Value (EV), Beta and share prices.

Review of Literature

Dornean and Oanea (2017)-This paper evaluated the relationship between Corporate Social Responsibility(CSR) and stock prices for the companies listed on Bucharest Stock Exchange (BSE) in 2015.It also investigates the difference in the market stock prices of companies. It highlights that stock return has a significant impact on CSR activities of a company.

Te Lee (2016)-This paper discussed about an endogenous relationship between CSR and stock price crash risk. Researchers have used two-stage least squares regression analysis to address the bias and inconsistency associated with endogeneity issues. The empirical results showed that CSR significantly mitigates Taiwanese stock price crash risk. This finding is consistent with the notion that socially responsible Taiwanese firms commit to a higher standard of transparency and engage in less hoarding, thus reducing crash risk. The empirical results also show that CSR has a more pronounced effect in mitigating crash risk for Taiwanese firms with less effective corporate governance

Fiori, Donato and Izzo (2015)-This article on the CSR strategy studied about how the companies can integrate the social responsibility into their strategy. This study investigated the impact of corporate social performance on the stock prices of Italian listed companies. It focused on the relationship between the CSR and financial performance, showing contradictory results about the company in a widely shared portion. They chose stock prices as a proxy for financial performance, in order to measure the perception and reaction of financial markets to the company's socially responsible behaviors. Different social parameters like concerning environment, community and employment activities which has a negative influence on the stock prices in the Italian Stock Market were also considered. The Italian investors perceived these practices as avoidable expenses reducing shareholder's income and companies value and recognition thereby giving a negative market premium, in terms of lower stock prices to socially responsible enterprises.

Johansson, Karlsson and Hagberg (2015)-Conducted an investigative study by examining the Stockholm OMX stock exchange and analyzing the relationship between Corporate Social Responsibility and financial performance of companies in terms of

CSR activities. It also did a longitudinal research aimed at investigating the commonly applied map changes in business and management research.

Zacchaeus, Oluwagbemiga and Olubenga (2014)-Evaluated the effects of CSR on stock prices of listed manufacturing companies in Nigeria.

Dinsmore (2014)-The purpose of their study was to examine the extent and nature of the collective relationship between CSR, proxied by the 2013 Best Corporate Citizens index, and corporate financial performance, proxied by an equal weight of Tobin's Q. The Stakeholder theory provided the framework for this study.

Zaccheaus, Oyerogba, Oluwagbemiga and Michael Olubenga (2014)-Their study investigated the effect of Corporate Social Responsibility Performance on the stock prices of Nigerian listed manufacturing companies. Its objective was to carry an empirical study on the relationship between CSR performance and stock price of listed manufacturing companies and also measure the performance in terms of money contributions made or expenditure that incurred by the companies and find out its improvement in respect of firm's corporate social responsibility activities concerning environment, community, and employment activities.

Flammer (2012) examined that the environmental corporate social responsibility generates new and competitive resources for firms. The companies which had reported to behave responsibly towards the environment experienced a significant stock price increase whereas firms that did not report so faced a significant stock price decrease. It positioned that the value of environmental CSR depends on external and internal moderators.

Donato and Izzo (2012)- investigated the impact of Corporates Social Performance on the stock prices of Italian listed companies. The study focused on the relation between Corporate Social Responsibility and financial performance and the idea behind the attempt to measure the perception and reaction of financial markets to the companies "socially responsible behavior". Study found that Italian investors perceive these practices as avoidable expenses reducing the shareholder's income and companies value and recognize a negative market premium, in terms of lower stock prices to socially responsible enterprises.

Significance of the Study

The Companies Act 2013 amendments have made the norms of corporate social responsibility stringent as the policy makers are expecting CSR spending by the corporate to be a major source for the developmental activities of the economy. Hence it is essential to understand how the various stakeholders react to bigger CSR spending. This study primarily focuses on that aspect.

Objectives

- To find out the impact of CSR spending on the share prices and Beta of the selected companies.
- To understand the relationship between CSR spending and goodwill of the selected companies.
- To analyze the connection between ESG disclosure scores and CSR spending.
- To understand the relationship between enterprise value and CSR spending of the selected companies

Hypotheses

H01 – There is no relationship between CSR spending and stock price movement of the company.

H02 – There is no relationship between CSR spending and beta.

H03 –There is no relationship between CSR spending and goodwill of the company.

H04 –There is no relationship between CSR spending and Enterprise value of the company.

H05 –There is no relationship between CSR spending and ESG disclosure scores of the company.

Research Methodology

Research type

The research is descriptive in nature.

Sources of Data

The data is collected using secondary sources as mentioned.

- Companies were selected based on the reports published by the National CSR Data portal.
- Stock prices – NSE website
- Goodwill, ESG disclosure, Enterprise value – Bloomberg Terminal
- CSR spending – Ministry of Corporate Affairs website.

Time period

Financial year 2014-15, 2015-16 & 2016-17.

Tools used

Beta

A beta coefficient is a measure of the volatility, or systematic risk, of an individual stock in comparison to the unsystematic risk of the entire market. In statistical terms, beta represents the slope of the line through a regression of data points from an individual stock's returns against those of the market. Beta is used in the capital asset pricing model (CAPM), which calculates the expected return of an asset using beta and expected market returns.

$$\text{Beta coefficient}(\beta) = \frac{\text{Covariance}(R_e, R_m)}{\text{Variance}(R_m)}$$

where:

R_e = the return on an individual stock

R_m = the return on the overall market

Covariance = how changes in a stock's returns are related to changes in the market's returns

Variance = how far the market's data points spread out from their average value

Correlation

Correlation is a statistic which measures the degree to which two securities move in relation to each other. Correlations are used in portfolio management, computed as the correlation coefficient, which has a value that must fall between -1.0 and +1.0.

A perfect positive correlation means that the correlation coefficient is exactly 1. This implies that as one security moves, either up or down, the other security moves in lockstep, in the same direction. A perfect negative correlation means that two assets move in opposite directions, while a zero correlation implies no relationship at all.

$$r = \frac{\sum(X - \overline{X})(Y - \overline{Y})}{\sqrt{\sum(X - \overline{X})^2}\sqrt{(Y - \overline{Y})^2}}$$

Where: r = the correlation coefficient, $\overline{X}$ = the average of observations of variable, XY = the average of observations of variable Y

Regression

Regression is a statistical measurement used in finance, investing, and other disciplines that attempts to determine the strength of the relationship between one dependent variable (usually denoted by Y) and a series of other changing variables (known as independent variables).

Linear regression: Y = a + bX + u

Multiple regression: Y = a + b1X1 + b2X2 + b3X3 + ... + btXt + u

Where: Y = the variable that you are trying to predict (dependent variable), X = the variable that you are using to predict Y (independent variable), a = the intercept, b = the slope, u = the regression residual.

Durbin Watson Test

The Durbin Watson Test is a measure of autocorrelation (also called serial correlation) in residuals from regression analysis. Autocorrelation is the similarity of a time series over successive time intervals. It can lead to underestimates of the standard error and can cause you to think predictors are significant when they are not.

The Hypothesis for the Durbin Watson test are:

H0 = no first order autocorrelation.

H1 = first order correlation exists.

(For a first order correlation, the lag is one time unit).

Assumptions are:

- That the errors are normally distributed with a mean of 0.
- The errors are stationary.

The test statistic is calculated with the following formula:

$$DW = \frac{\sum_{t=2}^{T}(e_t - e_{t-1})^2}{\sum_{t=1}^{T} e_t^2}$$

Key Findings

The analysis was done by comparing the CSR spending of the top 10 companies and their relationship with various parameters measuring company performance.

Table 1: Correlation Matrix

Correlation

		CSR	STOCKPRICE	BETA	GOODWILL	ESGDISCLOSURE	ENTERPRISEVALUE
CSR	Pearson Correlation	1	.253	-.353	.408*	.469**	.710**
	Sig. (2-tailed)		.177	.055	.025	.009	.000
	N	30	30	30	30	30	30
STOCKPRICE	Pearson Correlation	.253	1	-.471**	-.086	.426*	.586**
	Sig. (2-tailed)	.177		.009	.651	.019	.001
	N	30	30	30	30	30	30
BETA	Pearson Correlation	-.353	-.471**	1	.064	-.659**	-.653**
	Sig. (2-tailed)	.055	.009		.737	.000	.000
	N	30	30	30	30	30	30
GOODWILL	Pearson Correlation	.408*	-.086	.064	1	.288	.278
	Sig. (2-tailed)	.025	.651	.737		.123	.137
	N	30	30	30	30	30	30
ESGDISCLOSURE	Pearson Correlation	.469**	.426*	-.659**	.288	1	.722**
	Sig. (2-tailed)	.009	.019	.000	.123		.000
	N	30	30	30	30	30	30

ENTERPRISEVALUE	Pearson Correlation	.710**	.586**	-.653**	.278	.722**	1
	Sig. (2-tailed)	.000	.001	.000	.137	.000	
	N	30	30	30	30	30	30

Source: Author's data

*. Correlation is significant at the 0.05 level (2-tailed).

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

- From the analysis, it was found that the CSR spending of the companies is positively related to factors such as Goodwill, ESG Disclosures and Enterprise Value with a level of significance of 0.05, 0.01 and 0.01 respectively.
- There exists a positive correlation between stock price, ESG Disclosure and Enterprise Value.
- The beta shows a negative correlation with variables like Stock price, ESG Disclosure and Enterprise Value.
- It is also found that there is no relationship between CSR spending and beta value.

Hence it is concluded the Goodwill, ESG Disclosure score and Enterprise Value of the company is impacted by the CSR spending. Thus the below listed hypotheses are rejected.

- H03 –There is no relationship between CSR spending and goodwill of the company.
- H04 –There is no relationship between CSR spending and Enterprise value of the company.
- H05 –There is no relationship between CSR spending and ESG disclosure scores of the company.

Regression analysis

Table 2: Regression Analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.710[a]	.504	.486	115297.82909	1.828

a. Predictors: (Constant), CSR

b. Dependent Variable: ENTERPRISE VALUE (Source: Author's calculation)

Table 3: Regression Analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.469[a]	.220	.192	10.85426	.220	7.898	1	28	.009	2.223

a. Predictors: (Constant), CSR

b. Dependent Variable: ESG DISCLOSURE (Source: Author's calculation)

Table 4: Regression Analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.408[a]	.166	.137	4916.74415	.166	5.585	1	28	.025	2.215

a. Predictors: (Constant), CSR

b. Dependent Variable: GOODWILL

Source: Author's calculation

- From the regression analysis, it is proved that 50.4% of Enterprise value is influenced by the CSR spending of the company. The Durbin Watson score nearing 2, proves that the model does not have autocorrelation which makes the model reasonable.
- The CSR spending has influenced 19.2% of ESG disclosure and 13.2 % of goodwill. The Durbin Watson score of 2 and above concludes that the model has a negative auto correlation.

Suggestions

- Enterprise Value and Goodwill of the companies are increasing as a result of increased CSR spending. The CSR spending is definitely a factor which

emphasizes on the social commitment of the company and is thereby attracting the stakeholders to the company which in turn is increasing its market value.

- The CSR Spending and its disclosures are boosting the investor sentiments and the companies are able to amass funds from the market as the investors are viewing the companies as ethical and socially responsible.

Scope for further studies

The topic was primarily taken to analyze whether the CSR spending is having any relationship with other financial parameters. This study was able to conclude that there exists certain relationship between various variables. Hence, it is suggested that a study on a much higher scale needs to be done and the author plans to do an in-depth study with more data sets and variables in the near future.

Limitations of the study

- Lack of data on CSR Spending was a major hindrance.
- Since companies started publishing the CSR data only after the revised Companies Act norms, it was difficult to study the past trends of the CSR and related variables.

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Bloomberg Terminal

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Data Security in cloud service providers- a Comparison of different cryptographic methods

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Abstract --- In this current era of computer science, cryptography is for securing information and communication techniques and algorithms to transfer messages in way that are hard to decipher. Cryptosystems refer to mathematical procedures and computer programs. Now-a-days cloud computing is showing consistent growth in the field of computing. With the help of cloud and cryptography new era has begun in the field of technology. So that its easy to build privacy preserving storage model where data sharing services can update and control the access and limit the usage of their shared data. Preserving privacy is an important issue for cloud computing and it needs to be considered at every phase of design. This paper gives an idea on how the data is stored in cloud how they are secured and managed in cloud with the example of different platforms such as Google cloud , Azure and AWS.

Index Terms— Cryptography in Cloud, Client side Encryption, Server side Encryption, Key storage, cloud computing, meta data .

I. INTRODUCTION

Cryptography is the art of extreme information security. Better the cryptographic algorithm used security remains high. As cryptography is good, the message will remain secure. Cryptographic algorithms that take input data, called plaintext, and produce scrambled output . Scrambling, used in this sense, is much more than just moving letters around or exchanging some letters for others. After applying proper cryptographic algorithms, the output is typically in differentiate from a random string of data. Many cryptographic algorithms are reversible by knowing a particular secretket. Firstly in this paper we give a detail description about cryptography and its uses.

Section two gives us an idea about the clouds and its security systems. Cloud computing is one of the popular topics of the current world. Internet has started driving all these new technologies. Internet was designed firstly to be strong, but not completely safe. There are many data privacy concerns in cloud computing. Incorrect revelation of a data used in businesses in cloud to third parties is one of the major issues that has been found[4]. It contains a pool of computing resources that are accessed by the cloud users through Internet. The major benefits of using cloud are scalability, flexibility, efficient communication, reduced time and cost. A framework that can be followed easily to share the file which residing on the cloud with another cloud user. In this a concept of cryptography has been used to generate the secure key that can be shared among users.

In cloud computing integrity and privacy is very important. In the next section propose a study on how these techniques are applied in different platform. Gives separately how in client side and server side encryption are done. Their types subdivision are also mentioned clearly. The concept defined are almost same how they are implemented is different in different platforms. Algorithm used in these platform how they gives security, how data is manipulated and stored. For each platform they provide slit difference in the storage mechanism.

Section V gives full detail about the three different platforms I mentioned above. Section VI gives the difference between different platforms. The last section gives the future scope and conclusion about this paper. The reference section helped me in developing this paper successfully.

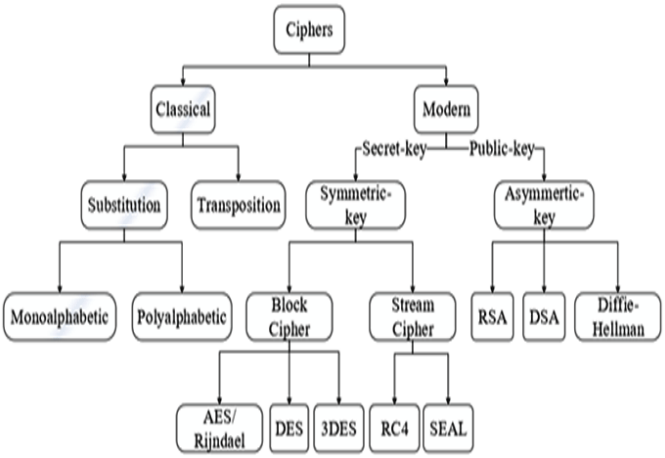
II. CRYPTOGRAPHY AND ITS NEEDS

Cryptography is the protecting technique of data from the unauthorized party by converting into the non-readable form. The main purpose of cryptography is maintaining the security of the data from third party. There are following two types of algorithms such as: (i) symmetric key based algorithm, sometimes known as conventional key algorithm and (ii) asymmetric key based algorithm, also known as public-key

algorithm. Symmetric algorithm can be further divided into two types.

Various cryptanalysis techniques are available to break most of the encryption algorithms at any time. Lot more algorithms are broken at different stages by eavesdroppers. Algorithms like block cipher or stream cipher or any other cipher types could be easily attacked by various cryptanalysis techniques. A brute force attack, linear and non-linear cryptanalysis, meet in the middle attack, man in the middle attack, and etc., are few to name.

Cryptography provides confidentiality, integrity, authentication and nonrepudiation of data. On the basis of key, there are two types of cryptographic schemes available. They are Symmetric and Asymmetric-key cryptography. These two types serve the purpose of confidentiality. The keys involved in symmetric key algorithm are identical for both data encryption and decryption. The users must choose the keys more carefully and the keys are securely distributed and stored. On the contrary, the asymmetric cryptography uses two mathematically linked distinct keys. Unlike in symmetric-key cryptography, plaintext and cipher-text are treated as integers in asymmetric-key cryptography [13].



A. Key Generation

The cryptographic systems in modern technology include symmetric-key algorithms (such as DES and AES) and public key algorithms (such as RSA). The user encrypts the data with the public key. Only the provider of the private key decrypts this data. The simplest method to read encrypted data is a brute force attack, meaning just attempting every number, up to the maximum length of the key. Therefore, it is important to use sufficiently longer key length since longer keys take longer time to attack, resulting brute force attack almost impractical.

B. Key Storage

The keys must be stored securely to maintain the security in the process of communications. There are various techniques in use for this purpose. The most common technique is that an encryption application manages to keep the keys for the user and it depends on an access password to control the use of the key.

C. Key Usage

The length of the key use is the major issue. The keys must be frequently changed as the required efforts of the attackers are on the increase. The frequent change in key also limits the loss of information. The frequency of usage decreases as the frequency of key change increases. This happens especially when the attacker tries to trace the keys. Symmetric keys have been used for longer times since key exchange has become a difficult process. The symmetric keys must change with every data or interaction, so that only the intended data will become accessible eve n if the key is stolen, cryptanalyzed, or socially engineered.[1]

III. IMPLEMENTATION OF CLOUD

Cloud is one of the widely used technology due to its efficient infrastructure and deployment model. It contains a pool of computing resources that are accessed by the cloud users through Internet.[14] The major benefits of using cloud are scalability, flexibility, efficient communication, reduced time and cost. Providing security to cloud is the demanding task for enabling a secure storage and access of the data.

In cloud computing, Data sharing is an essential aspect for secure, efficient and flexible sharing of data with the other authorized users. New public-key cryptosystems produce Coded texts which are of constant size so that decryption rights for sets of Coded texts can be efficiently secret keys which are aggregated. The user who possesses the secret key is allowed to release a constant-size aggregate key so that Coded text set can be flexibly chosen while ensuring that the other encrypted files out of the set stay confidential.[12][7]

Figure :Basic cloud computing

Cloud Computing provides three kinds of services:0

i) Private cloud: This type of cloud owned by the organization is meant to provide services to its own users.

ii) Public cloud: Third party are providing the services. Examples include Amazon Web Services (AWS), Microsoft Azure, IBM/SoftLayer and Google Compute Engine.

iii) Hybrid cloud: This is a combination of services provided by private and public clouds. The main goal of this kind is to achieve scalability.

IV. LAYERS AND SECURITY ISSUES IN CLOUD

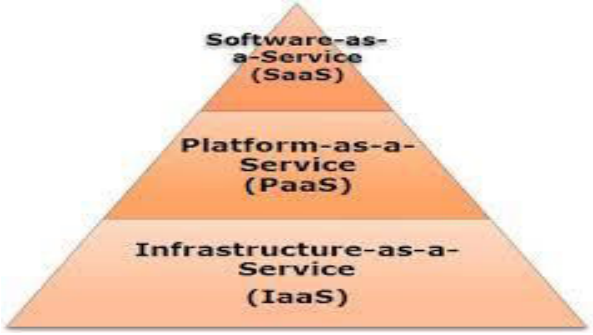
Cloud computing has three categories of services:

i) Infrastructure as a service: It helps users to transfer work from one machine to another, usually a virtual machine.

ii) Platform as a Service: PaaS is used for general software development. Common PaaS providers include Salesforce.com's , Force.com, Amazon Elastic Beanstalk, and Google App Engine.

iii) Software as a service: SaaS delivers software applications over the Internet; these are often called Web Services. Microsoft Office 365 is an example of an SaaS. [2]

Cloud computing seems really simple to the consumers of cloud as in access cloud, place or retrieves required data that's all. But the internal cloud is built on three very important layers.[11] Those layers are named as software as a service (SaaS), Platform as a service (Paas) and Infrastructure as a service (IaaS). Various cloud service providers provide different kind of services based on those layers. On the first level that is software as services, various applications reside that provides an interface to end users. This layer generally allows access to internal data with some authentication mechanism. The second layer is a platform as a service, this layer contains various mappings of users request to the required resource that resides on cloud computing. At last there is infrastructure layer that is most time contains virtual machines and infrastructure that user can request for computations. Each layer of cloud contains its own vulnerabilities. Like software as a service, layer uses authentication mechanism to validate owner's identity on the document, but this can be broken if someone possess security code that is being used for authentication.



V. PLATFORMS

A. AMAZON WEB SERVICES

AWS provides multiple services to help you protect your data at rest or in transit. the cloud services provided by Amazon, known as Amazon Web Services (AWS), has gained special attention over the past few years. AWS- AWS is a cloud service provider, which is an illustration of accurate cloud computing that offers cloud services and keeps the user data confidential, secured and available. It is the provider of on demand services and the user has to pay for only the resources he uses. Data is at the core of business today, and data encryption offers a solid way to make sure that data stays secure. As one of the most popular storage services on AWS, Amazon S3 has several encryption methods available.[8][9]

AWS has several offerings in the data encryption space. In addition to the Amazon S3 encryption offerings discussed here, Amazon Elastic Block Store (AWS EBS) encryption options are also available.

- ***SSE Data Encryption***

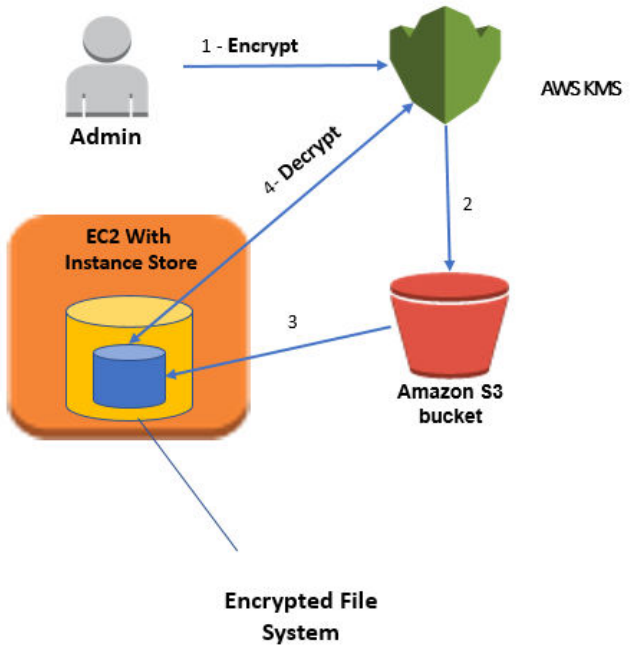
Within Amazon S3, Server Side Encryption (SSE) is the simplest data encryption option available. SSE encryption manages the heavy lifting of encryption on the AWS side, and falls into two types: SSE-S3 and SSE-C.The SSE-S3 option lets AWS manage the key for you, which requires that you trust them with that information. With SSE-S3, you don't have access to see or encrypt data using the key directly, but you can be assured that the raw data you own is encrypted at rest by AWS's standard processes.The SSE-C option similarly manages encryption and decryption of your data for you, but uses a key provided by you (the customer) and passed in to

AWS with each request to encrypt or decrypt. AWS does not store your key with this method, so you are responsible for its safe keeping.

- ***CSE Data Encryption***

S3 Client-Side Encryption puts all the responsibility for the encryption heavy lifting onto the user. Rather than allowing AWS to encrypt your data, you perform the encryption within your own data center and upload the encrypted data directly to AWS. S3 Client-Side Encryption also comes in two options: server-side master key storage, and client-side master key storage. In server-side master key storage, you can store your master key server-side in the AWS KMS (Key Management Service) service, and AWS will provide sophisticated key management software to manage sub-keys based on the master key that is used to encrypt your data. In client-side master key storage, your master keys aren't stored on AWS's servers, and you take full responsibility for the encryption. Using this second approach is potentially the most secure, as your keys and data are never seen by Amazon servers in an unencrypted state. However, the level of security that you can achieve with this method depends on the integrity of your own processes and technology rather than AWS's.

Architectural Overview



In this architectural diagram:

1. The administrator encrypts a secret password by using KMS. The encrypted password is stored in a file.
2. The administrator puts the file containing the encrypted password in an S3 bucket.
3. At instance boot time, the instance copies the encrypted file to an internal disk.

- ***AWS Services***

1. AWS Key Management Service (KMS)-- AWS KMS is a managed service that enables easy creation and control of encryption keys used to encrypt data. KMS uses envelope encryption in which data is encrypted using a data key that is then encrypted using a master key. Master keys can also be used to encrypt and decrypt up to 4 kilobytes of data. In our solution, I use KMS encrypt/decrypt APIs to encrypt the encrypted file system's password
2. AWS CloudTrail -- CloudTrail records AWS API calls for your account. KMS and CloudTrail are fully integrated, which means CloudTrail logs each request to and from KMS for future auditing. This post's solution enables CloudTrail for monitoring and audit
3. Amazon S3 – S3 is an AWS storage I use S3 in this post to save the encrypted file system password.
4. AWS Identity and Access Management -- AWS IAM enables you to control access securely to AWS services. In this post, I configure and attach a policy to EC2 instances that allows access to the S3 bucket to read the encrypted password file and to KMS to decrypt the file system password.

B. GOOGLE CLOUD

Google uses several layers of encryption to protect customer data at rest in Google Cloud Platform products. Google Cloud Platform encrypts customer content stored at rest, without any action required from the customer, using one or more encryption mechanisms. Data for storage is split into chunks, and each chunk is encrypted with a unique data encryption key. These data encryption keys are stored with the data, encrypted with ("wrapped" by) key encryption keys that are exclusively stored and used inside Google's central Key Management Service. Google's Key Management Service is redundant and globally distributed. Data stored in Google Cloud Platform is encrypted at the storage level using either AES256 or AES128. Google uses a common cryptographic library, Tink, to implement encryption consistently across almost all Google Cloud Platform products. Because this common library is widely accessible, only a small team of cryptographers needs to properly implement and maintain this tightly controlled and reviewed code.

For many individuals and companies, security is a deciding factor in choosing a public cloud vendor. At Google, security is of the utmost importance. We take security and privacy seriously, and we work tirelessly to protect your data —

whether it is traveling over the Internet, moving between our data centers , or stored on our servers. Central to our comprehensive security strategy is encryption in transit and at rest, which ensures the data can be accessed only by the authorized roles and services with audited access to the encryption keys. This paper describes Google's approach to encryption at rest for the Google Cloud Platform, and how Google uses it to keep your information more secure. This document is targeted at CISOs and security operations teams currently using or considering using Google Cloud Platform. With the exception of the introduction, this document assumes a basic understanding of encryption and cryptographic primitives.[10]

Google Refine or Open Refine is a free and powerful tool for cleaning, reconciling and transforming messy and unstructured data. It is a web-based application, therefore, the datasets can be linked and extended with the external data and various web services. Many web services also allow Google Refine to upload cleaned data to a central database. Google uses several layers of encryption to protect customer data at rest in Google Cloud Platform products. Data for storage are split into chunks and further encryption are done. Data are entered by the customers through their account. Customer data includes (i)contents (ii)metadata. Also key management plays an important role here.

Google uses several layers of encryption to protect data. Using multiple layers of encryption adds redundant data protection and allows us to select the optimal approach based on application requirements. Several layers of encryption are used to protect data stored in Google Cloud Platform. Either

distributed file system encryption or database and file storage encryption is in place for almost all files; and storage device encryption is in place for almost all files. Google uses the Advanced Encryption Standard (AES) algorithm to encrypt data at rest. AES is widely used because both AES256 and AES128 are recommended by the National Institute of Standards and Technology (NIST) for long-term storage use (as of March 2019), and AES is often included as part of customer compliance requirements.

C. MICROSOFT AZURE

Microsoft Azure is a flexible cloud platform that allows fast development, debugging and iteration of the applications, as well as their further management through a network of Microsoft data centers.[5] Applications can be developed with any tool, programming language, or existing framework, while there is possibility of integrating public cloud applications with existing IT environment. To subscribe to the Azure, it is necessary to use some of the Microsoft Live accounts (Live, Hotmail, Outlook) and credit card. After completing the registration the user can make the purchase of needed resources in the cloud. VMs generation is performed from a management console, with the possibility of selecting different options among the list of those that are available.[15]

Azure is a foundation for fleeing data in the cloud. Instead of giving programming that Microsoft customers can present and run themselves in solitude PCs. Nowadays, Azure is an association: Customers utilize it to sprint apps and stockpile facts & figures on web-accessible devices rued by Microsoft Corporation. Azure Platform is a web-based distributed technology. Extremely systematic, changeable and compatible capacity can be utilized to a mass unused apps to remain constant.

Components of window's azure : i]Computer: Windows procedure can run a gathering of vocations. Whatever an application does, regardless, it needs to be done as no short of what one occupation. Azure at that factor typically runs a variety of examples of each movement, utilizing worked in load changing as per spread needs crosswise over them. ii] Storage: The 2nd stage in Azure is a limit. We have three journalists perfect here – Blobs, that take after records, Tables, which are entered and well-shaped limit, and lines, which let Web Parts and Specialist Parts, provide for one another. iii] Fabric Controller: The 3rd sort out in Azure is the connect controller or App connect. It handles articulations and association – between Microsoft Windows Azure applications, and in development from the servers. Ready to express that we got the opportunity to have that expansive SQL Server or Database structure and enabling access to an Azure app, & we will not permit customers of an app in our framework.

VI. COMPARITIVE STUDY

	AWS	AZURE	GOOGLE
YEAR (officially)	**2006**	**2011**	**2008**
TECHNOLOGY	**EC2 Service**	**Virtual Machine**	**Computer Engine**
STORAGE	**S3** **EFS** **EBD**	**Blob Storage** **File Storage** **Disk**	**Cloud Storage** **Persistent Disk**

		Storage	
DATA WAREHOUSE	**Aurora** **RDS** **RedShift**	**Data Lake Store** **SQL Database** **Table Storage**	**Cloud Datastore** **Cloud SQL** **Cloud Bigtable**
KEY CLOUD TOOLS	**Athena** **Lex** **Deep lens**	**Data factory** **Bot Service** **Functions**	**Big Query** **Cloud Dataflow** **Cloud Functions**
INTERNET OF THINGS	**IoT Greengrass**	**IoT Hub**	**Cloud IoT core**

VII. FUTURE SCOPE

The next era of cryptography lies in associated with the key used for encryption and decryption purpose. There is some many advantages and disadvantages for the use of key. As the new technologies come to play security issues are solved to a large extend .

Another way that overcome the threats of key is by using unclonable key. It simply means cryptography without using secret key. Most security applications, for instance, access to buildings or digital signatures, use cryptographic keys that must at all costs be kept secret. Using a physical unclonable key (PUK) – which can be a stroke of white paint on a surface – and the quantum properties of light.

VIII. CONCLUSION

All the platforms mentioned above offer rich set of features and the selection between them is a factor of the user needs. This study help us to get a detailed idea about the different platforms, how each parts of encryption, storage, manipulation works. As a review all the platform have their own signature in different and unique way but the basic is same in all the platform.

With the help of cryptography the cloud technology come to most secured and privacy one. Different algorithms are implemented in every stage of cloud system for improving the level of security.

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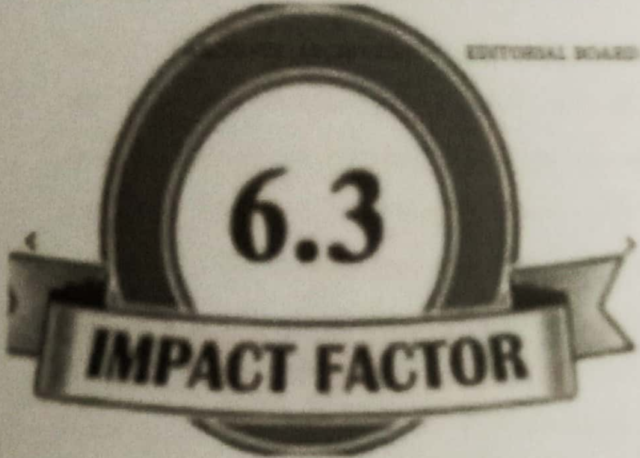

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EDUCATION 4.0 IN INDIA AND CHALLENGES IN TEACHING- LEARNING PROCESS

Submitted by :

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ABSTRACT

Industry 4.0 is all about advanced analytics, Robotics, Artificial Intelligence, Internet of Things (IOT) and process digitization. In sync industry 4.0, has emerged the Education 4.0 that focusses on a sustainable, global and a collaborative approach. This revolution is all set to bring about enormous change in the education sector. This would encourage learners to equip with skills like adaptability, learnability and agility as well as teachers to equip with special skills catering to the requirement of students and the system as such. The teaching –learning process always assumes a central thrust area in the education system. Quite a lot of factors contribute for an effective learning to happen. The quality of teachers, students and a conducive learning environment contribute a lot to effective learning. This paper discusses the challenges faced in the teaching learning process in the context of Education 4.0.

INTRODUCTION

Industry has seen many revolution from industry 1.0 to the one currently happening, Industry 4.0. Industrial revolution 1.0 was all about mechanization using water power or steam. Industrial revolution 2.0 focused on mass production using electricity and 3.0 on automation using electronic and IT systems. Now it is Industry 4.0 which has brought in disruptive environment. This disruptive environment is created by big data, robotics and automation, artificial intelligence, augmented reality, internet of things and too much emphasis on process digitization. This disruptive environment is sure to bring an ocean of change in workplace at a speed that is unimaginable. The changes in workplace is sure to affect the education sector as well. With the workplace demanding new skills, the education sector must ready for the desired supply . In sync industry 4.0, has emerged the Education 4.0 that focusses on a sustainable, global and a

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Empowering Intrusion Detection System in Cloud based Applications

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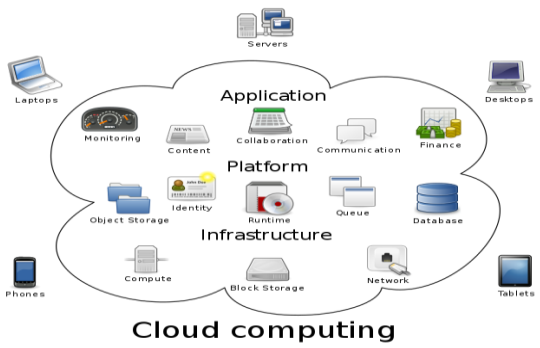
***Abstract*:-Today, Most of the IT organization prefers Cloud Computing as their choice because of its flexibility and pay-per-use based services to its users. However, the security and privacy is a major challenge in its success because of its distributed and open architecture which is vulnerable to intruders. Intrusion Detection system is the most commonly used mechanism to detect attacks on cloud based applications. IDS monitor the applications hosted in the cloud and alerts when an attack attempt is detected. This paper provides the method that empowers the Intrusion Detection System to detect attacks in cloud based applications and classify through clustering algorithm. This approach can create normality models of isolated user sessions that include both the web front-end (HTTP) and back-end (File or SQL) network transactions with respect to Data volumes and Classify them. The project implements a lightweight virtualization technique to assign each user's web session to a dedicated container, an isolated virtual computing environment. The system then use clustering algorithm to accurately associate each web request with the subsequent DB queries and build a causal mapping profile by taking both the cloud server and DB traffic into account. Finally the system is able to detect attacks both in static and dynamic websites with 100 percent accuracy by reducing the processing time.**

Keywords : Intrusion detection system , Cloud based applications, K-means clustering, double guard, Virtualization techniques

I. INTRODUCTION

Cloud computing is an emerging technology adopted by organizations of all scale due to its low-cost and pay-as-you-go structure. It has revolutionized the IT Industry with its unique and ubiquitous features. Organization prefers cloud as it replaces the high price infrastructure and need of maintenance. It provides a variety of services to end users in on-demand basis. 1. Software as a Service, 2.Platform as a service 3.Infrastructure as a service.



Intrusion detection techniques are used in any computing environment as a layer of defense. The basic aim is to detect any malicious activity well before any significant harm is possible. The general idea is to detect and identify attacks by either analyzing system artifacts (such as log files, process lists, etc.), or by keeping track of network traffic. Two main approaches used are signature based detection and anomaly-based detection. Signature based detection works by defining patterns of known attack signatures. If the system is found to be processing any code similar to those signatures, it is detected suspicious and marked as an intrusion. On the other hand, anomaly based detection works by analyzing activities performed on the system. Initially, a profile for a particular system is created by recording normal activities (e.g., by setting thresholds for normal bandwidth usage). If later on, the system's behavior is analyzed as anomalous to the profile defined, it is marked as an intrusion. Whereas signature-based detection techniques (also called misuse pattern matching) cannot detect unknown attacks, anomaly based techniques usually result in huge false positives or negatives.

II RELATED WORKS

Intrusion detection system in cloud computing : Challenges and Opportunities , This paper provides an overview of different intrusions in cloud. Then, analyzing some existing cloud based intrusion detection systems (IDS) with respect to their type, positioning, detection time, detection technique, data source and attacks they can detect. The analysis also provides limitations of each technique to evaluate whether they fulfill the security requirements of cloud computing environment or not. We emphasize the deployment of IDS that uses multiple detection methods to cope with security challenges in cloud.

Anomaly-Based Intrusion Detection System [7], is a system for detecting computer intrusions and misuse by monitoring system activity and classifying it as either *normal* or *anomalous*. The classification is based on heuristics or rules, rather than patterns or signatures, and will detect any type of misuse that falls out of normal system operation. This is as opposed to signature based systems which can only detect attacks for which a signature has previously been created.

Intrusion Recovery for Database-backed Web Applications [8] In this paper Users or administrators must manually inspect the application for signs of an attack that exploited the vulnerability, and if an attack is found, they must track down the attacker's actions

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Vol. 9 Issue 09, September-2020

and repair the damage by hand. When an administrator learns of security vulnerability in a web application, he or she can use WARP to check whether that vulnerability was recently exploited, and to recover from any resulting intrusions.

III INTRUSIONS IN CLOUD

A Attacks on hypervisor

An attacker may successfully control the virtual machines by compromising the hypervisor. The most common attacks on virtual layer are SubVir [8], BLUEPILL [9], and DKSM [10] which enable hackers to supervise host through hypervisor. Attackers target the hypervisor or VMs to access them by exploiting the zero-day vulnerabilities in virtual machines [11], prior to the developers' awareness about such exploits [3]. The exploitation of a zero-day vulnerability in the HyperVM application caused damage to several websites based on virtual server

B U2R attacks(User to Root)

The attacker uses password sniffing to access a genuine user's account which enables him to obtain root privileges to a system by exploiting vulnerabilities, e.g. Root shells can be created by using Buffer overflows from a root-level process. In the cloud scenario, attacker achieves root privileges of host or VMs by first getting access to legal user instances. This attack violates the integrity of cloud based systems

C. Insider Attack

The attackers are the authorized users who try to obtain and misuse the privileges that are either assigned or not assigned to them officially. This attack is closely related to trust since insiders may reveal secrets to opponents, e.g. Amazon Elastic Compute Cloud (EC2) suffered from an internal DoS attack. This attack breaches the confidentiality of cloud users

D. Backdoor channel attacks

Hackers can remotely access the infected machines by exploiting this passive attack to compromise the confidentiality of user information. Hacker can use backdoor channels to get control of victim's resources and utilize it as zombie to launch DDoS attack. This attack targets the confidentiality and availability of cloud users.

E . DOS Attacks

The attacker exploits zombies for sending a large number of network packets to overwhelm the available resources. Consequently, legitimate users are unable to access the services offered over the Internet. In cloud environment, the attacker may send huge number of requests through zombies to access VMs thus disabling their availability to legitimate users which is called DoS attack This attack targets the availability of cloud resources.

IV TYPES OF INTRUSION DETECTION SYSTEM

A. Network based Intrusion Detection System

Network intrusion detection system monitors and analyzes network traffic by reading individual packets through network layer and transport layer. It searches for any suspicious activity or network based attack such as Denial of Service (DoS) attack, port scans etc. Once an abnormal behavior in network traffic is identified, alert can be sent to system administrator. Most of the commercial IDSs are based on the NIDS such as Snort, Tcpdump and Natural flight Recorder (Mehmood, Habiba, et al., 2013). These are well known for general sized networks and convenient for implementation to detect intrusions. However, (Kumar, & Hanumanthappa, 2012) discussed the main issues of Snort IDS when integrating with distributed computing environment. To overcome the issues, they introduced new approach for handling these issues. For virtual network systems, multi phase distributed vulnerability detection and measurement technique has been proposed to detect DDoS attack (Chung, Khatkar, et al. 2013). It has detected attacks based on attack graph by analyzing network traffic flowing through virtual machines. It has significantly improved attack detection and mitigates attack consequences.

B. Host based Intrusion Detection System

Host based intrusion detection system monitors the individual host or device on the network by analyzing any change in the activity performed by host and events occurring within that host. It looks at every activity of host by checking application logs, system calls, and file-system modifications, inbound and outbound packets to and from host. If any suspicious activity is found, an alert is generated and sent to administrator to protect the system from malicious attack. Since majority of sectors prefer HIDS also after NIDS which are mainly based on the log file analysis of system. A model of HIDS has been developed based on log file analysis of Microsoft Windows XP operating system. It detects intrusions by matching predefined pattern with the logs of operating system (Ali, & Len, 2011)

C. Distributed based Intrusion Detection System

Distributed IDS (DIDS) also known as hybrid IDS, consists of two or more detection methods or systems i.e., NIDS, HIDS etc. This type of system is deployed over large distributed network like cloud computing so as all entities can communicate with each other and with network monitor such as central server In this way, all hosts deployed over network collect system information and send it to central server by converting it into standard format

D. VMM/Hypervisor based Intrusion Detection System

Hypervisor provides a platform for communication among VMs. Hypervisor based IDSs is deployed at the hypervisor layer. It helps in analysis of available information for detection of anomalous activities. The information is based on communication at various levels like communication between VM and hypervisor, between VMs and communication within the hypervisor based virtual network.

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ISSN: 2278-0181
Vol. 9 Issue 09, September-2020

V METHODOLOGY

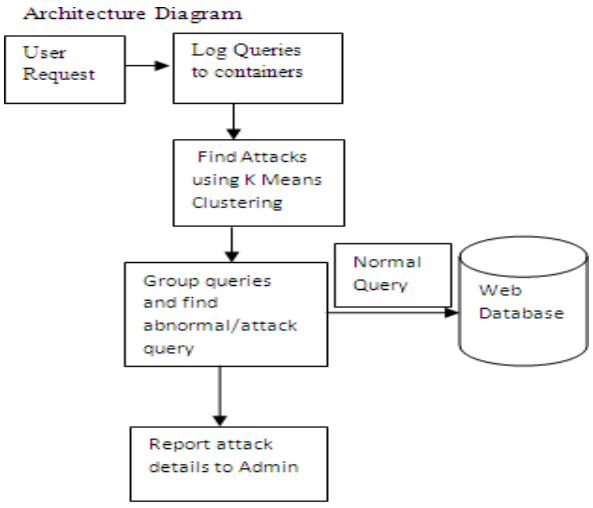

Fig 1 Architecture Diagram

Building normality model

A static testing website is deployed using the Content Management System assign each user session into a container, each container is assigned per each new IP address of the client. The container will log all the Web requests and SQL Queries executed by client. Deterministic Mapping and the Empty Query Set Mapping patterns are discovered from training sessions.

Attack scenarios

This system is effective and can reduce the computation time at detecting the following types of attacks:

A. Injection Attack

This SQL injection attack changes the structure of the SQL queries. It would generate SQL queries in a different structure that could be detected as a deviation from the SQL query structure that would normally follow such a web request.

Ex-

Original query=select * from admin where uid="1";

Suspicious query=select * from admin where uid="„ OR 1=1;--„

Here, original query is passed and suspicious query is blocked. Word-list contains the tokens of sql-query strings.

„O"-Original query

„S"-Suspecious query

Ex- („O") select * from admin where uid = „1„;

("S") select * from admin where uid = „ „ OR 1=1;--„

("O") select * from admin where uid ="1" && pwd ="abc";

(„S") select * from admin where uid = „ „ OR 1=1;--„

B. URL Manipulation

A Client manually adjusts the parameters of its request by maintaining the URL's syntax but altering its semantic meaning. This system can easily capture the attack because it would generate SQL queries that actually not match with the training sessions. *Privilege Escalation Attack*

A privilege escalation attack is a type of network intrusion that takes advantage of programming errors or design flaws to grant the attacker elevated access to the network and its associated data and applications.

Let's consider that the dynamic website serves both regular users and administrators. For a regular user, the web request Ru will trigger the set of SQL queries Qu, and for an administrator, the request Ra will trigger the set of admin level queries Qa. Now an attacker logs into the webserver as a normal user, upgrades his privileges and act as administrator to trigger admin queries to obtain administrators data.

This approach can detect this type of attack since the DB query Qa does not match with the request Ru according to the proposed mapping model.

C. Session Hijacking

Session Hijacking is an attack by which the hacker steals this user's session identifier and then sends this session identifier as their own to the server and tricks the server into thinking they are that user. By hijacking other user sessions, the attacker can eavesdrop, send spoofed replies, and/or drop user requests. A session- hijacking attack can be further categorized as a Spoofing/Man-in-the-Middle attack, an Exfiltration Attack, a Denial-of-Service/Packet Drop attack, or a Replay attack.

According to the mapping model, if found the same session identifier from two different IP would be treated as hijacked session

D. Mapping models

1. Finding deterministic mapping queries

Deterministic Mapping is the most common and perfectly matched pattern. Web request rm appears in all traffic with the SQL queries set Qn. If Qn is present in the session traffic without the corresponding rm is classified as intrusion [1].

2. Finding Empty Query Set

In special cases, the SQL query set may be the empty set. This implies that the web request neither causes

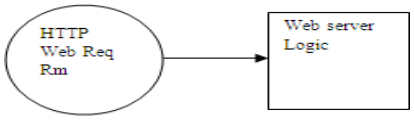

Fig 4 Empty Query Set

nor generates any database queries. For Example, when a web request for retrieving an image GIF file from the same webserver is made, a mapping relationship does not exist because only the web requests are observed. This type of mapping is called rm->O;. During the testing phase, keep these web requests together in the set EQS

3. No Matched Request

In Some cases, DB queries cannot match up with any web requests, therefore these queries are kept in No Match Request. During testing phase any query within the set No Match Request is considered as legitimate. If found anything abnormal then it is treated as attack.

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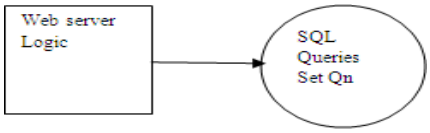


Fig 5 No Matched Request

4. Non Deterministic Mapping

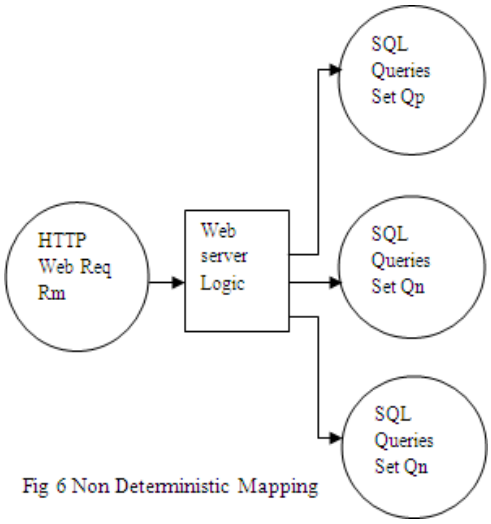


Fig 6 Non Deterministic Mapping

This happens only within dynamic websites, such as blogs or forum sites. Because the same web request may result in different SQL query sets based on input parameters Each time that the same type of web request arrives, it always matches up with one (and only one) of the query sets The mapping model is Rm € Qi (Qi € {Qp, Qr, Qq}).

Clustering Algorithm for Attack Classification

The algorithm accepts two inputs. The data(container) itself, and "k", the number of clusters. The output is k clusters with input data partitioned among them.
The aim of K-means (or clustering) is this: To group the items into k clusters such that all items in same cluster are as similar to each other as possible. And items not in same cluster are as different as possible. The distance measures are used to calculate similarity and dissimilarity. One of the important concept in K-means is that of centroid. Each cluster has a centroid. Consider it as the point that is most representative of the cluster. Equivalently, centroid is point that is the "center" of a cluster.
The output of the clustering is given as input to above modules to get optimized result for detecting intrusion in website.

K means algorithm for attack classification

1. Initialize logged queries for container
2. Randomly choose k queries and make them as initial centroids.
3. For each point, find the nearest centroid and assign the point to the cluster associated with the nearest centroid.
4. Update the centroid of each cluster based on the items in that cluster. Typically, the new centroid will be the average of all points in the cluster.
5. Repeats steps 2 and 3, till no point queries are clustered.

VI PERFORMANCE EVALUATION

To evaluate the output for this system, different attacks have been analyzed, as discussed in Section 4.2, by implementing real spatial datasets by developing online portal website for real-estate agencies and hosted in the cloud. The datasets given are 50, 150, 250 and the time required for existing and proposed method is also shown below in the table as such that the performance of the proposed system shows the low value of time taken. This system then compare the cost of the algorithms with respect for queries with influence scores. The below table shows the cost of the algorithms by varying the number k of requested results by retrieving time

TABLE I

No of Data's	Normal Time	Clustered time
50	.97 sec	.85 sec
150	1.25 sec	1.12 sec
250	1.45	1.23 sec

Fig. 7 Comparison between Normal and Cluster classification based on time

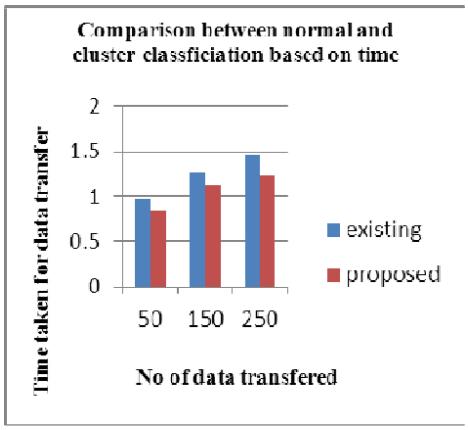
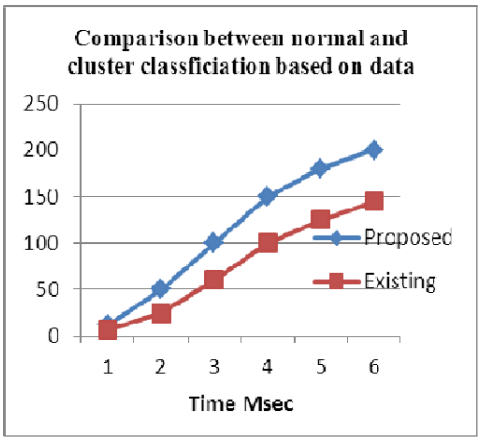


Fig. 8 Comparison between Normal and Cluster classification based on data



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Vol. 9 Issue 09, September-2020

VII CONCLUSION

This paper presented an Intrusion detection system that builds models of normal behavior for Cloud based applications from both front-end web (HTTP) requests and back-end database (SQL) queries. Unlike previous approaches that correlated or summarized alerts generated by independent IDSs, This approach forms container- based IDS with multiple input streams to produce alerts. K Means Clustering Algorithm is used efficiently to classify attacks from logged Queries. We have shown that such correlation of input streams provides a better characterization of the system for anomaly detection because the intrusion sensor has a more precise normality model that detects a wider range of threats and reduce classification time largely.

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English Language: Unravelling the Secrets

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***Abstract*— English has surely walked an exceptionally long path, from humble beginnings in the streets of Angla-land to being the major language on earth. Once regarded as the language of the lower class, English is today a global power to be reckoned with, a force that pushes the world forward and a language with immense glory and a rich history. Propelled by the various works of eminent writers, English has been able to develop, grow and expand to a standardised language which holds the key to future. Through this article I would like to unravel the secrets of this language and to achieve the objective, we must travel through the various ages English and England has plodded.**

***Keywords*— English, History, Standardised Language, Global Power**

I. INTRODUCTION

English language is one of the predominant forms of communication, with its influences on +2 billion people globally. Computerization and globalization are the main reasons for the acceptance and spread of English language. At present English has become a lingua franca, a global language. It is a rich language with tens of thousands more words in its vocabulary than any other language. It is the most generally used language in international trade, mass entertainment, diplomacy, international telecommunications and scientific publications, publishing newspapers and other books.

In today's world, the knowledge of English language makes an individual literate, in contrast to the past where those who process degrees and diplomas were considered so. The command over the English language boosts up one's personality also. Now schools and universities give extra care in instilling communication skills in English due to the ocean of career opportunities and has become an inevitable requirement for several professions such as computing and medicine.

As a teacher, I have been witnessing the growth of English language day by day. Now the world has started to respect and accept those who speak this language well. It is a prestige language nowadays but only a few know about the journey of English language from its humble origins to the language that eased trade and communication in today's world. Most people consider English as a language used by the elite. Though it may be true to an extend today, its past speaks a different story.

Language is a great mystery and perhaps that is why we need to think about it more deeply and carefully. Evolution does not occur on its own. One's evolution may lead to another's demise. Accordingly, the evolution of English language has been influenced by many external factors. Through this article I would like to take you back to the origin of English language and the various ages through which it has transcended.

Why is there a need for studying the past of a language that can be used at ease today? The answer is the same as why we need to study the past of any culture, nation, institution, person, or idea. It gives us the base on which it was build, shows us how it has evolved into what we see or use today, and it also helps us in improving it further. What we create on a strong base stay strong.

II. EXPLORATION OF ENGLISH LANGUAGE

Language is something particular to humans and this essential ability to speak distinguishes humans from all other living things. As a communicative tool, language helps us to express our ideas and concepts, as well as moods, feelings, and attitudes. The enigmatic nature of language will begin to unfold itself once you realise that it cannot be studied in isolation. we know that language is a system of communication used by a country or community. Thus, English language is related to English people. This study focuses on the people and the periods through which English Language has commenced its journey. Quirks and inconsistencies aside, the history surrounding its monumental rise is both a fascinating and rich one. Let us start our exploration from the early settlers of England.

III. EARLY SETTLERS IN ENGLAND

We have only a limited information about the early settlers in England. As per the historical records Iberians were the first inhabitants in England, who came through the Iberian Peninsula from their home in Africa. We are unsure about their time period or contributions to England. After them Celts (600-55 BC) came and occupied the land. The new invaders, the Celts, pushed the Iberians away from

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their habitats towards the less hospitable north and the marshy west. Place names like Kent, London dover, river Thames, Wye were the contributions of Celtic language. After the celts, Romans (55BC-410 AD) conquered England in 55 B.C.

The first Roman expedition to Britain, under the command of Julius ceaser, 'The Glorious Star on Roman Firmament', took place in the year 55 BC. They ruled the country for more than four centuries. Their main contribution to English people was Christian faith. By the end of third century all the people in England accepted Christianity. The language in England before English was Latin which was the result of romanisation of the island.

IV. Germanic conquest – Dawn of English Language

An event that profoundly affected the course of history-was the invasion of Britain by some Germanic tribes, after the depart of the Romans from the island of Britain about 449 AD. Venerable Bede's Ecclesiastical History of English People (731 AD) tells that the Germanic tribes who conquered England were the Jutes, the Saxons, and Angles. England comes from the word Angles. The newly conquered land was called 'Anglaland', or 'land of the Angles'. The writers called the language of these invaders as Englisc. And later the land and its people were called Anglecynn (Angle-kin). English is thus older than England. With the available information we can conclude that, English language took off with the invasion of Britain during the 5th century. English language as it is spoken today has risen from the dialects spoken by the Germanic tribes. Since then the evolution of English has been an unbroken one.

Contrary to our belief, the English language has never had an official standard. It has evolved through centuries and adopted many thousands of words through overseas exploration, international trade, and the building of an empire. It has progressed from a dialect of Germanic settlers in the 5th century, to a global language in the 21st century. To unravel the truths of English language, we have to travel through three English periods. The journey through these three periods is inevitable because these periods help us in reaching the present status of English in 21st century.

V. Making of English: Three Periods

More than 1500 year of its existence, English has developed incessantly. We can divide these developments in to three main periods. They are:

- Old English:450-1100
- Middle English:1100-1500
- Modern English: 1500 to the present

VI. Old English

Old English was not exclusively a uniform language .we can identify four dialects in Old English , Northumbrian, Mercian,West Saxon and Kentish .West Saxon gradually gained ascendancy and the documents which enable us to study Old English are documents of West Saxon .

The period of Old English is a period of full inflections. In contrast to Modern English, Old English had three genders (masculine, feminine, neuter) in the noun and adjective. Nouns, pronouns, and adjectives were inflected for case. Noun and adjective paradigms had four cases (nominative, genitive, dative, and accusative) while pronouns also had forms for the instrumental case. Old English had strong verbs (called in contemporary grammars as irregular verbs) than does Modern English. The verbs which were strong in Old English are weak (regular) verbs in Modern English. The old English period was a multilingual period-A period with several languages being used simultaneously. English interacted with Celtic, Latin, and Scandinavian languages. English language borrowed words from other languages to enhance its vocabulary.

In vocabulary old English was very resourceful in the formation of words by means of prefixes and suffixes. It was possible to form more than a hundred words from the same root. This feature was widely used to form verbs with about twelve common prefixes. Another remarkable feature was the large number of self-explaining compounds. This capacity for forming new words by combining the existing ones and by deriving them with the help of prefixes and suffixes gave a remarkable variety and flexibility to Old English. This is apparent in its literature which is distinguished for its poetry.

The best recognized surviving example in Old English is the poem Beowulf. It is considered as the oldest known English poem and is notable for its length - 3,183 lines. It was written in Britain more than one thousand years ago and the author is anonymous.

Website: ijetms.in Issue:6, Volume No.4, September-2020 DOI: 10.46647/ijetms.2020.v04i06.006

After Old English comes the Middle English Period, a lot of changes happened during this period which starts from 1100 AD and lasts up to 1500 AD.

VII. THE MIDDLE ENGLISH PERIOD (1100 AD- 1500 AD)

As mentioned before, it is in fact a period in which changes occurred in every aspect of the language. The greatest single factor for this was the conquest of England and the Anglo – Saxons by the Duke of Normandy, William the Conqueror, familiarly known as the Norman Conquest in 1066 AD. The new overlords spoke a language of Old French known as Anglo-Norman. The entire English nobility was replaced by French aristocracy and the French language robbed English of its rightful place. The influence of the Normans can be illustrated by these two words, beef, and cow. Beef, usually eaten by the aristocracy, taken from the Anglo-Norman, while the Anglo-Saxon commoners, who tended the cattle, kept the Germanic cow. Several legal languages, such as jury, indict, and verdict, have Anglo-Norman roots because the Normans were running the courts. Thus the words commonly used by the aristocracy have Romantic roots and words used normally by the Anglo-Saxon masses have Germanic roots. Thus, French language became the language of the elite groups and English became the language of the masses.

The situation got changed when King John lost the province of Normandy to the King of France in 1204 AD. This started a process where the Norman nobles of England became gradually more separated from their French cousins. England became the primary concern of the nobility, rather than estates in France, and as a result the nobility adopted modified English as their native tongue. The ruling class began to think in English and thus began the process of rehabilitation of English.

English language got supremacy over French language due to many reasons. The Hundred Years War made French the language of the enemy. It was a long conflict set against the kings and kingdoms of France and England from 1337 to 1453 over several issues. There were two factors for the origin of the conflict: first was, the kings of England wanted independent possession. Second, the kings of England, as the closest relatives of the last direct Capetian king (Charles IV, who had died in 1328), from 1337 claimed the crown of France. In the Wake of the Hundred Years' War, many English regarded French as the enemy's language. Consequently, the English people started to think about their own language and the status of the English language rose to a different level and as a result Oxford and Cambridge universities were founded. Thus literacy increased, Though the books were still hand-copied and expensive.

Another reason for the acceptance of English was Black death, a pandemic that devastated Europe between 1347 and 1351which had taken a proportionately greater toll of life than any other known epidemic or war up to that time. The most afflicted were the poor more than rich which made labour scarce. A more lasting and serious outcome was the drastic reduction of the amount of land under cultivation, due to the deaths of so many labourers. This proved to be the ruin of many landowners. The shortage of labour compelled them to substitute wages or money rents in place of labour services to keep their tenants. This resulted in the rise in wages for artisans and peasants. And this increased the social and economic importance of the labouring class and with it the importance of English language which they spoke than Anglo Norman. This combination of the two languages came to be known as Middle English.

The Resurgent middle English literature signifies the revitalised English language and its important place in English life. Fourteenth century is the age of Geoffrey Chaucer (1350-1400),the father of English poetry and the author of Troilus and Criseyde and The Canterbury Tales, William Langland the author of a long social allegory Piers Plowman and John Wycliffe (1384)translator of The Bible also belong to this age. The 15th century saw extended use of English as a literary medium and had several distinguished writers of prose such Malory, Lydgate, and Caxton. It was during the 14th century that a different dialect (known as the East-Midlands) began to develop around the London area.

Geoffrey Chaucer, a writer we have come to identify as the Father of English Literature and author of the widely renowned Canterbury Tales, was often heralded as the greatest poet of that particular time. It was through his various works that the English language was “approved” alongside those of French and Latin, though he continued to write up some of his characters in the northern dialects.

Chaucer’s The Canterbury Tales was the most well-known masterpiece of Middle English ,an unfinished series of stories(written during the last 14 years of its author’s life(1387 – 1400)) suggesting to be told by a group of pilgrims journeying from London to the shrine of St. Thomas Becket . Geoffrey Chaucer (1340–1400), who was the son of a wealthy wine merchant, weaves together stories told by 28 pilgrims whom the storyteller (the poet himself) met at an inn, epitomise all facets of English social life—aristocracy, clergy, commoners, and even a middle

Website: ijetms.in Issue:6, Volume No.4, September-2020 DOI: 10.46647/ijetms.2020.v04i06.006

class, which was not officially familiar by the social structure of the day, but which, in fact, existed.

It may not seem unusual to modern readers that Chaucer wrote in the language that people in his area spoke, which is called vernacular. But it was a bold decision because most poets during that time were writing in an earlier version of the language such as French, or Latin, which were considered as the languages of scholars, religious figures, and upper-class people. As an upper-class, well-educated person himself, Chaucer would have been able to write in various languages. But he chose to write The Canterbury Tales in the vernacular of his country that more people would understand and connect to. For this reason, The Canterbury Tales is regarded as one of the first poems written in the English language, and Chaucer himself is one of the "fathers" of the written English language.

After 1349 English began to be used again in the schools. By 1362, the linguistic separation between the nobleness and the commoners was largely over. In that year, the act of pleading was accepted, which made English the language of the courts and it initiated to be used in Parliament. In the 15th century French became restricted as the language of culture and fashion. English now was once again adopted as the language for records of towns and guilds and in 1425 English came to be generally adopted in writing.

The English Renaissance sprouted during the end of the 15th century. It was associated with the rebirth of societal and cultural movements. Though it was slow to gather steam during the initial phases, celebrated the heights of glory during the Elizabethan Age. The end of the 16th and start of the 17th century, English language was greatly influenced by the writings of actor and playwright, William Shakespeare. It is because he started writing during a time when the English language was undergoing serious changes due to contact with other nations through war, colonisation etc. These changes were further cemented by different writers. Shakespeare and other emerging playwrights realised that their ideas could not be expressed through the English language currently in circulation. So, they modified the adopted words or phrases from other languages and added to the English language, creating a richer experience for all concerned.

Accompanied by middle English comes the Elizabethan age, associated with the reign of Queen Elizabeth I (1558-1603) , considered the Golden Age of English literature,. The Elizabethan Age as part of the Renaissance period, rebirth of the arts, saw the development of Elizabethan poetry and the stability of England. Probably the most splendid age in the history of English literature was the Elizabethan literature, contributed to the emergence of great writers namely Sir Philip Sidney, Edmund Spenser, Roger Ascham, Richard Hooker, Christopher Marlowe, and William Shakespeare. , Under Elizabeth's reign, drama became a unifying influence, drawing people of different social classes together and was not exclusively restricted to the gentry or upper class. Commoners and royalty could enjoy the same performance in each other's company, even though in separate seating arrangements.

The finest culmination in English language happened during this period, the Elizabethan age in general and due to the great Shakespeare in particular. With Shakespeare, English Literature was on the threshold of the modern period. Elizabeth's England truly became a Golden age because of Shakespeare, who came from the little village of Stratford on the banks of the River Avon. He was a boy who had only elementary grammar school education, a runaway to London to escape punishment for poaching in the Kings forest. In London, he did anything that a young man could do to earn his living .He thus got involved in the Elizabethan Theatre at all levels starting at the very bottom of the ladder and climbing up step by step to actor ,dramatist ,and finally shareholder in the Lord Chamberlain's players .He wrote on an average two plays during the years from 1588 to 1611 .He wrote comedies ,historical plays and tragedies .

The best manifestation of Shakespeare's genius is to be found in the great tragedies that he has crafted. His first tragedies were experimental ones. Titus Andronicus with its spectacular violence, Romeo and Juliet with its tragic adolescent love are different from the usual Elizabethan tragedies. Julius Caesar is not merely a political tale but the story of how men fall victim to a train of events which arise from wrong judgement , which they can do nothing to arrest .Each of Shakespeare's great tragedies is built on a truth which remains forever and changed by the progress of time . Thus, Hamlet is a revenged tragedy, Othello a domestic tragedy, King Lear a social tragedy, Macbeth the tragedy of overweening ambition and Antony and Cleopatra a heroic tragedy. The Tempest, the one in which he bids goodbye to his art of creating a magical world peopled by Kings and clowns, lovers and villains, fairies, and spirits, is the last of Shakespeare plays, The Elizabethan age came to an end with the death of Shakespeare.

VIII. MODERN ENGLISH

Modern period can be associated with the process of standardization. Grammatically, English settled down as an analytical language in the hands of Shakespeare and other writers. It had developed into a fit medium for both prose and poetry and conscious efforts were made to make it an

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appropriate vehicle for science. Many Spelling reforms were undertaken, dictionaries were composed, and English was transplanted to other lands through colonisation, giving rise to new, non-native varieties of English. Caxton's innovation of Printing Press was key in standardizing the English , something ,English learners should be grateful for .

Many factors resulted in the standardization of English language. It started with the renaissance followed by the industrial revolution. The third was the migration and settlement in new lands like USA, Australia, Canada, and New Zealand. The fourth was the Imperial colonisation of Asian and African lands. All these have contributed to the making of modern English and towards making it a world language.

A. Standardization Process in English Language

The standardisation process proceeds in four interlinked stages. The process of standardization is an on-going one, and a whole range of forces are at work. The different stages are:

a. Selection of the standard variety:

Variability in regional dialects, class dialects, situational varieties are facts of life for almost all languages. Standardisation represents an attempt to minimise if not eliminate this high degree of variability. The easiest solution seems to select and elevate one of these varieties to the status of the standard.

b. Acceptance of the functions of the standard:

The 'acceptance' by the community of the norms of the variety selected over those of rival varieties, through the promotion, spread, establishment and enforcement of the norms. This is accomplished through institutions, agencies, authorities such as schools, ministries, the media, cultural establishments, etc.

c. Elaboration of the functions of the standard:

For the variety selected to represent the desired norms, it must be able to discharge a whole range of functions that it may be called upon to fulfil, including abstract, intellectual functions. Where it lacks resources to do so, these are developed. Thus, a standard language is often characterised as possessing 'maximal variation in function, minimal variation in form'.

d. Codification:

The norms and rules of grammar, use, etc. Which govern the variety selected must be formulated.it is an attempt to 'fix 'the standard variety in dictionaries and grammars, spellers, manuals of style, texts, etc.

Let us discuss these in detail.

B. Selection of the East Midland dialect as the dominant variety

The roots of the selection of standard variety of English lie with the merchant class based in London. Their spoken dialect was the East Midland dialect. By the end of the 14th century East Midland was an emergent written standard with variations in the dialect .After about 1430 ,one of these variants became progressively dominant because of its use in government and official documents along with being greatly reinforced and accelerated by the printing press .

It took some time for the East Midland speech of the London merchants to acquire prestige. Another reason for the acceptance of East Midland dialect was the role played by the universities in England. Students from around England came together in the two universities of Oxford and Cambridge ,only a few miles from London .London was the centre of trade. In the triangle formed by these three centres, a great deal of East Midlands speech would have been heard, and possibly used as a kind of Lingua Franca among a mobile social group .It would have helped to spread East Midland, because of its usefulness in communicating with the people who spoke another dialect .

There is also political dimension to the selection of the standard variety apart from the regional and social economic factors. when ideas about nationhood and political autonomy gained currency, a standard had emerged in England too like in France and Spain.

C. Acceptance of the Standard:

By the middle of the 15th century, East Midland dialect had been accepted as a written standard for official documents. But its acceptance was not specific: it was a matter of convention rather than a diktat. for example, Chaucer wrote in the East Midland dialect as it was spoken in London; but when his manuscript was reproduced , the dialect was silently altered by different scribes in different parts of the country– there was no sense of a literary norm. and by the 16th century, i.e. by the time of Shakespeare the standard variety was well established in the domain of literature .Acceptance of the standard, therefore ,occasions a rejection of kinds of English that are felt to be outside the norm . For instance, one dialect which was chosen by playwrights and others was Kentish. E.g.: Edgar's speech in King Lear. Such literary practises reflect the mounting awareness of a standard variety during the 16th century. By then actions were being made to define the standard, it had reached the stage of unambiguous acceptance.

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D. Elaboration of Function

At this Stage there was an effort to achieve the major goals of standardization: maximal usage in function. In the domains of law, government, literature religion scholarship and education, the new standard had to function wherein previously only Latin and French were used. It became mandatory to develop novel structures and new meanings appropriate to its use in different domains. Each group of Specialist- lawyers, writers of religious text, administrators -cultivated their own registers within the standard.

Let us examine certain elaboration of the functions of the Standard English Language.

There was a great deal of controversy among scholars on the use and potential of English as a literary medium. Scholars considered English unsuitable for composing great works of literature as according to them English was dull, cantered, and barbarous. By 1580s the controversy had subsided, and the balance had been achieved between native usage and foreign importation. English was declared to have achieved a state of eloquence by the works of great poets like Spencer ,Sidney and Shakespeare who had composed works that many felt were a competition for any literature .this instilled a new-found confidence among writers to conduct stylistic experiments .

Another important domain was that of religion. The 16th century saw a flurry of legal translation, preparation of prayer books and other Christian texts. This process of venularization culminated in the publication of the authorized version of the Bible in 1611.This version gave English what might be called classical variety of its own.

Inspired by the example of the Authorized version, writers began to nurture prose to such an extent that 17th century became called the century of prose. A significant aspect of that trend was the increased use of language writing of a scientific and scholarly nature followed by developing interest in science and philosophy. People wrote political pamphlets, journals essays, and the first newspapers in English that enhanced use of English which in turn improved the status of the language.

Displacing Latin, English gradually became the language of education and Grammar schools were founded. and there was a gradual loosening of the church's hold on institutions of learning and literacy. The expansion of secular education increased the demand for learning of English.

E. Codification

It is the final stage of the process of standardization. Elimination of variation and stemming the process of change, constitute the stage called codification. In the codification of English, the example set by other languages is of immense importance. The codifiers looked back at classical Latin and envied the fixity and order of its grammar. Moreover, there were other models too to emulate. For a time, the idea of an English Academy was introduced and among its greatest advocates were figures like Swift, Dryden, and Defoe. But by the middle of the 18th century support for such an institution had diminished. As a result, certain substitutes to the Academy were recommended. These include books written or composed by established scholars and literary men.

The most famous was the Dictionary of Dr. Johnson. Dr.Johnson's dictionary is important not only in the field of spelling standardization but also in the sphere of the codification of words and meanings .His contribution lies in the fact that he provided an alphabetical list of all the words in the standard language with their meanings . He listed the range of meanings for each word including the widespread; and he illustrated each strand of meaning with the quotations from writers. In addition, he also provides certain facts about the nature of language, its history, and its grammar. The prestige enjoyed by the dictionary during the late 18th and early 19th century was enormous. The individuality of Johnson can be seen on almost every page of his dictionary. His work is a landmark in the history of standardization of English.

The second half of the 18th century was also the elevated water-mark for the codification of grammar.Although treatises on English grammar had begun to appear in the 16th century, and in the 17th century were compiled by authors such as Ben Johnson and Milton it was only in the 18th century that we find a striking outburst of interest in grammar . Certain traditional structures were replaced by more 'accurate' forms. For instance, the English pattern 'it's me' which had been common for centuries and still is, was deemed incorrect since it did not follow the Latin usage. Hence it was replaced with it is I. Another example is in relation to negation. According to traditional English pattern' I do not know nothing' signalled negation by the cumulative use of negative particles. By the end of the 18th century, this had been labelled illogical, by applying the rule that 'two negatives make a positive'. Thus, throughout the 18th century the grammarians were busy codifying rules about grammatical usage and the English we use today is largely a result of these reforms.

Website: ijetms.in Issue:6, Volume No.4, September-2020 DOI: 10.46647/ijetms.2020.v04i06.006

Next important aspect to codify was Pronunciation. The English spelling is the most imperfect and inappropriate model for the sounds we make. People have felt bound by it for more than 400 years. In the 16th century some scholars were attracted to the codification of pronunciation as it was a mixed variety of different areas and traditional spelling systems. Codification of the other levels of structure led to the production of the pronouncing dictionary. Thus, Johnson's dictionary had codified both words and spellings .and now the spelling was virtually fixed. This process of codification of pronunciation was simultaneously accompanied by the elimination of certain sort of pronunciation. For instance ,the most barbarous kind of pronunciation was that associated with the cockney speech of London and people were asked not to follow it .A pronunciation that may be described as codified grew up ,cultivated and were taught in public schools by the early 19th century. Thus, the process of standardization was intricately related to social, political, religious and educational factors.

The above-mentioned process helped to make English Language a standardised language and now it has been accepted as an international language.

IX. THE PRESENT STATUS OF ENGLISH LANGUAGE

Now the importance of English in the modern world is quite large. Quite recently it was a foreign language for most of us, and today it is international. The study of English is of great importance in all countries of the world. Everyone dreams of studying it at least at the initial level. Today, children begin to learn this language even at preschool age. Many do not understand whether English is needed in the modern world. However, it is not a secret for anyone that today he plays an important role in the job placement. To find a prestigious and highly paid position people must necessarily know the English language well. Because of this reason, large firms often cooperate with foreign partners.

Modern English is an extremely diverse language which has absorbed much from many other languages. There are over 300 million native English speakers in the world, and between 400 and 800 million foreign speakers. It is the official language of air transport and shipping; the prominent language of science, technology, computers, and trade; and the major language used for education, publications, and international negotiations.

The world of today needs English for some of the following reasons:

A. Internet:

Internet plays a crucial role to promote and to spread the English language throughout the globe and more and more people are exposed to the English language and it has become the language of the internet as well.

B. Education:

The field of education has amplified the function of English Language. Most of the educational resources, materials and books are in English. The lack of English knowledge makes anyone insufficient in the realm of education in today's world.

C. Communication:

The most important function of a language is to communicate properly. To communicate successfully, one needs a language that is commonly understood by most of the people in the speech community. English becomes an efficient instrument to communicate with everyone around the world. Information technology uses this ability of English to function well in the field of communication by internet and emails.

D. Travel:

English is spoken around the globe next to Mandarin Chinese. It has been stated that out of the nearly six billion people living in the world today around three hundred and fifty million do speak English. It has become the International Business Language. Many countries around the world make use of English Language for the governance. The relationship among the countries around the world is enhanced by the effective communication in English. Language differs from nation to nation. When we travel around the globe, the English Language becomes the rescue factor to communicate with everyone.

E. Business:

English language has been the language of business in today's electronic world and it is the trading language of the world. A sound knowledge of English Language makes an individual to be a successful businessman around the world. A good number of companies have ventured into sending the production to overseas to cut down their costs. In other words, the companies around the world are in to outsourcing and offshoring business. To communicate with the businesspeople of other countries, English Language becomes the effective tool.

X. CONCLUSION

We would find no immediate resemblances between Modern English and Old English, when one endeavours to study various English language courses taught today. English grammar has become remarkably refined

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(smartphone messaging has made a mockery of the English language itself). The basic history and development of a language which was generated from the embers of wars fought between ferocious civilisations. Imagine the trials and tribulations that our descendants went through, their readiness to give up everything to achieve freedom of speech and expression. We are indebted to our great ancestors for standardising this language. But now we take it for granted when we have courses to improve English at the touch of a button. Maybe you are a fan of Shakespeare, John Milton, or J.K. Rowling etc. And all the great literary writers bring into life more than just words on a page but a living history that continues to evolve to this day.

The influence of English spread throughout the British Isles, during the medieval and early modern period. Its influence began to be felt throughout the world, from the early seventeenth century onwards .The reasons for the significant changes in English language were the complex processes of exploration, colonization and overseas trade that characterized Britain's external relations for several centuries . Words were taken from all over the world, often via the languages of other trading and imperial nations. At the same time, new varieties of English appeared, each with their own distinctions of vocabulary and grammar and their own distinct pronunciations. At present English has been accepted as a lingua franca, a global language, used and understood by many nations for whom English is not their first language

English is thus an incredibly old language. But the reason for its relevance even today is because it's ever evolving. The evolution of English is not restricted to a certain reason, but a variety of reasons be it social, economic, cultural, or political. The fact is that this international language is growing along with its speakers. Today English is not an endemic language because it has changed according to its surroundings. The very fact that there are many types of English like American, Indian, or Australian is evidence to this. Many words are being added to this language while many are forgotten. Thus, the evolution of English is an ongoing process. And this is the very reason English is relevant even today, after all only the fittest will survive.

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Comparative Study of Rice Disease Detection Methods using Digital Image Processing

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Comparative Study of Rice Disease Detection Methods using Digital Image Processing

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***Abstract*:** Rice is the most important cash crop in India. About 80-90% of the diseases which occur on the leaves of rice are Bacterial leaf blight, Leaf smut and Brown spot. This paper presents a survey on detection and classification of rice leaf diseases and a comparative study. It is difficult for the farmers to predict these diseases using naked eye. Thus, in order to identify the rice leaf diseases accurately, the use of image processing and machine learning techniques can be helpful. This paper reviews related research papers from the period between 2015 and 2020. The related studies are compared based on image segmentation, feature extraction, feature selection and classification.

Keywords: Leaf diseases, Image pre-processing, Image segmentation, Otsu's thresholding, Support Vector Machine (SVM), Fuzzy Classifier, Histogram of Gradient(hog), Local Binary Pattern(LBP), Median Filter, Deep Neural Network(DNN), Jaya Algorithm(JOA).

1. Introduction

In an around 60% of Indian economy relies upon agriculture. Due to increase of development on the agricultural yield, generation of the harvests in agriculture must be improved. The goal is kept in mind to develop the diseases detection in earlier. Diseases are investigated using different image processing techniques. The image processing is the technique which process the digital information stored in the form of images. The plant disease detection is the technique which detects disease from the input images and rectify the classification of diseases.

Over the past decades, rice crops are admitted as one of the powerful source for the production of resources. Rice plant diseases are considered as a raising factor behind the agriculture and communal loss in the development of the agricultural field. A number of disease detection, identification and quantification methods have been developed and applied in a wide variety of crops. Thus this paper consists of 6 sections. Types of rice leaf diseases in section 2, different method for detection in section 3, survey on rice leaf diseases in section 4, result and discussion in section 5 and conclusion in section 6.

2. Types of Rice Leaf Diseases and their Characteristics

There are mainly three types of diseases which affects the whole plant. They are bacterial leaf blight, leaf smut and brown spot. They are shown in figure 1, 2 and 3.

2.1. Bacteria Blight Diseases

Rice bacterial blight, also called bacterial blight of diseases deadly bacterial disease that is among the most destructive afflictions of cultivated rice. Symptoms first appear as tiny, water-soaked, linear lesions between the leaf veins. These streaks are initially dark green and later become light brown and then to yellowish gray color. The lesions are translucent when held against the light. Entire leaves may become brown and die when the disease is very severe and also when complexity increases.

2.2. Leaf Smut

The characteristic sign of rice with leaf smut is the presence of small black spots on the leaves. They are slightly raised and angular and give the leaves the appearance of having been sprinkled with ground pepper. Coverage by these spots is most complete on the oldest leaves. The tips of some leaves with infection may die.

2.3. Brown Spot

Brown spot is a fungal disease that infects the main parts of coleoptile, leaves, leaf sheath, and panicle branches. Its most observable part is the numerous big spots on the leaves which can kill the whole leaf. When infection occurs in the seed, unfilled grains or spotted or discolored seeds are formed. Infected seedlings have small, circular, yellow brown or brown lesions. Starting at tillering stage, lesions can be observed on the leaves.

They are initially tiny, circular, and dark brown to purple-brown. Fully developed lesions are circular to oval with a light brown to gray center.

Figure 1. Bacteria Blight

Figure 2. Leaf Smut

Figure 3. Brown Spot

3. General Characteristic Methods using Digital Image Processing

General approach for detecting the leaf disease is shown in figure 4. Image acquisition, image pre-processing, image segmentation and feature extraction steps of image processing are discussed in this section. Several classification techniques are also discussed.

3.1. Image Acquisition

The process of acquiring images from various sources is known as image acquisition [1] [2] [3] [4] [5] [6] [7]. Acquisition of image is very challenging. It require proper gadget like scanner or good resolution camera.

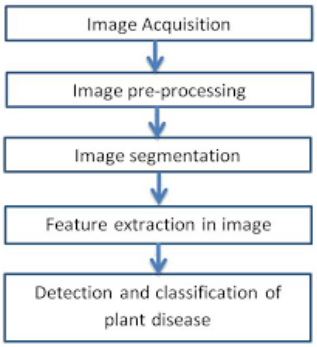

Figure 4. General Approach for Detection and Classification of leaf Disease

3.2. Image Preprocessing

The aim of pre-processing is to improve the quality of image by removing unwanted noise from the image. Few researchers have worked on removal of background and shadow from the image. This process involves image resize, image restoration (filtering) and image enhancement.

3.2.1. Resize: The original images will be resized [4] to a fixed resolution to improve the memory storage capacity and to reduce the computational complexity. The resizing image will reduce to the dimension of 640 x 480 pixels.

3.2.2. Noice Restoration: Image restoration is an operation which takes a noisy image as an input and gives clean or original image as an output. Weiner filter, median filter, average filter etc. are some of the of image restoration methods.

Weiner filter[5] is used to reduce the noise in signal. This is done by comparison of received signal with an estimation of a desired noiseless signal by a linear time invariant, also it gives minimum mean square error.

The Median Filter [1] [7] is a non-linear digital filtering technique, it preserves edges while removing noise.

3.2.3. Image Enhancement: This process will improve the low intensity [2] of original image by reducing its dynamic range and/or increasing its contrast. Gray scale conversion too been implemented [4]. This process will enhance the quality of the image that suits the image processing analysis.

The Histogram Equalization (HE) [3] method is used to enhance the contrast of the acquired image. This method will be equalizing the intensities of an image or reordering the curve by flattening.

Adaptive histogram equalization is a method that calculate several histograms of distinct section of the image, and with that they redistribute the lightness of the image. The original Red, Green and Blue (RGB) color image is transformed into Hue Saturation Value (HSV) color space [4]. Then, it will be split into a single component which Hue (H), Saturation (S) and Value (V) from HSV respectively. Only V component is enhanced while other components remain in its coordinates. After enhancement, the new V component is merged back to its color space.

L*A*B* color space chosen due to the uniform distribution of colors as it visualize same as human perception of color [6]. It consists of a luminosity layer 'L*', chromaticity layer 'A*' represents red-green axis and chromaticity-layer 'B*' represents where the color place along the blue-yellow axis.

3.3. Image Segmentation

Image segmentation is used to divide the image into various segments. Different types of techniques available for segmentation are K-means clustering, Otsu thresholding, Fuzzy, Sobel segmentation etc.

3.3.1. K-means Clustering: K-means clustering is one of the simplest and popular unsupervised machine learning algorithms [3] [4] [5]. The K-means algorithm initially finds k number of centroids, and then redistribute every data point to the nearest cluster, while keeping the distance from centroids as small as possible.

3.3.2. Simple Linear Interactive Clustering: The Simple Linear Interactive Clustering (SLIC) technique is a super pixel based algorithm that segments [7] the image based on color intensities. After the edges of the image are obtained the small openings are connected by specifying the disc size. The resulting image is called the dilated image. Then the diseased portions can be neglected. The larger portions are obtained by specifying the pixel size of the group and the obtained image is called the area open image.

3.4. Feature Extraction

Feature extraction is a type of dimensionality reduction technique, which efficiently represents the most informative parts of the image. There are mainly three types of features such as color, shape, and texture.

3.4.1. Texture Extraction: The Gray-level co-occurrence matrix (GLCM) [1][4][7]functions characterize the texture of an image by calculating how often pairs of pixel with specific values and in a specified spatial relationship occur in an image, creating a GLCM, and then finding statistical measures from this GLCM matrix.

Local Binary Pattern (LBP) [6] is an efficient texture extraction operator which name the pixels of an image by thresholding pixel and its surrounding pixels and returns result as a binary number. Central value is selected as the threshold value and it thresholds the surrounding pixels into 0s and 1s comparing with the central value and returns matrix containing only binary values, concatenate the binary values and convert it into decimal value.

Blob analysis is the method [2] of analyzing an image that has undergone binarization (converting gray image to 0s and 1s) processing. Blob analysis is image processing's basic method for analyzing the shape feature such as number, area, position, length, and direction of lumps.

3.4.2. Shape Extraction: HOG feature descriptor: It is widely used in computer vision tasks for object detection [6]. The HOG descriptor aims on the shape of an object. This is done by extracting the gradient and orientation of the edges. The complete image is broken down into smaller regions and for each region, the gradients and orientation are calculated.

3.4.3. Color Extraction: Color Histogram is the most widely used technique for extracting the color feature of an image [4]. It represents the frequency of color intensity in an image. It counts similar pixels and store it.

CCLM (color co-occurrence matrix): Color co-occurrence matrix gives spatial information about color images which ignores the intensity information for the image [5]. GLCM provides intensity information of the image.

3.5. Classification

Classification is a method to classify the set of data into different classes or different categories. To achieve this, trained computer must we have to learn the relationship between the classes and the data. Then it will be easy to classify the process under the terms and conditions. Some of the classifiers are:

3.5.1. Support Vector Machine (SVM): Support vector machine is based on concept of decision planes that defines the decision boundaries to separate data [2] [5] [6] as seen in figure 5. Hyper plane is used to separate data in SVM. SVM use a set of mathematical tools that are defined as the kernel. The function of kernel is to take data as input and transform into high dimensional space. These kernel functions are of different types linear, nonlinear, polynomial, radial basis function (RBF), sigmoid etc.

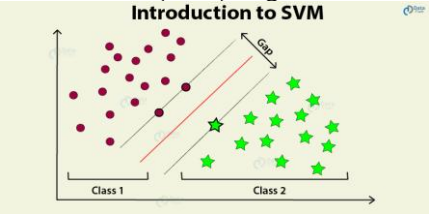

Figure 5. SVM Classifier

3.5.2 Neural Network (NN): Neural networks are an interconnected collection of nodes called neurons or perceptron's. Every neuron takes one piece of the input data, typically one pixel of the image, and applies a simple computation, called an activation function to generate a result. Each neuron has a numerical weight that affects its result. That result is fed to additional neural layers until at the end of the process the neural network generates a prediction for each input or pixel.

This process in fig.4 is repeated for a large number of images, and the network learns the most appropriate weights for each neuron which provide accurate predictions, in a process called back propagation (BPNN) [7]. Once a model is trained, it is applied to a new set of images which did not participate in training (a test or validation set), to test its accuracy.

3.5.3. Deep neural network (DNN) with JOA: DNN is designed with two hidden layers for perfectly [4] learning the mapping relation between the input and output data. In the training phase, by using the JOA the DNN iteratively updates the weight of the nodes in the hidden layers. The method is shown in figure 6.

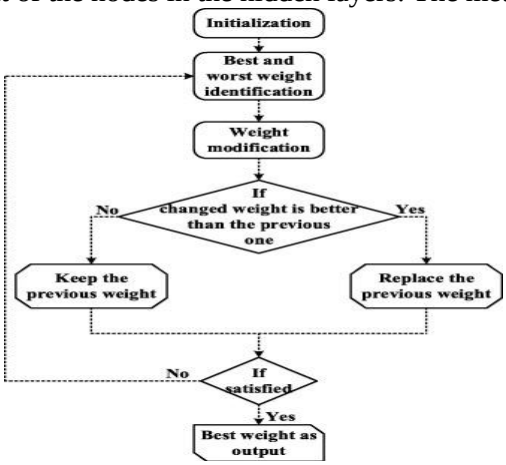

Figure 6. JOA Algorithm

4. Survey on Detection and Classification of Rice Leaf Diseases

In this section, a survey for detection and classification of rice leaf diseases is carried out.

G. Acanthi *et al*. (2019)[1] takes gray scale image and done preprocessing by median filter. Fuzzy clustering is used to segment the image. This is the best method because of gradual membership of data pints in different clusters. GLCM and SURF is used to extract the texture features such as contrast, entropy, uniformity and homogeneity by using joint probability matrix and finally classification of disease is done using artificial neural network (ANN) with multiple nodes and some function, this is done to gain insight of a problem. The advantage of using ANN is that it does not create problem while missing data because it work with incomplete data set.

Dr. Neha Mangla *et al*. (2019)[2] uses some preprocessing methods to enhance the quality of image. Otsu thresholding method is used to segment the image based on threshold coefficient obtained through genetic algorithm. Features extraction is done to extract shape such as object, width, length using blob analysis method. Color also is been extracted to identify lesions. Classification of disease is done using support vector machine (SVM) that create decision boundary hyper plane between two different classes which maximizes the margin.

K.S. Archana *et al*.(2018)[3] captures the image set using digital camera and done the preprocessing steps such as brightness improvement task and contrast improvement task for removing the blurred image. And the color transformation is done to segment image from RGB format to HSV format by normalization of RGB values. Finally the segmentation is done using K-means clustering. The advantage of this method is such that it separate leaf color, sign color and illumination from different color channel.

S. Ramesh *et al*.(2019)[4] uses a dataset totally with 650 images that consist of 95 normal image and 560 diseased images . The preprocessing is done by reducing the dimension to 300*450 pixels and the RGB image is transformed to HSV and the original image is added with the binary converted saturation part to get the background removed image. K-means clustering is done on the HSV, contained background image and a threshold value is obtained by plotting histogram based on highest value of hue component for diseased and non-diseased image. Texture features such as homogeneity, contrast, correlation and energy are extracted using GLCM. Color features such as mean and standard deviation are extracted for RGB, HSV and LAB color space. And at last classification is done using Deep Neural Network (DNN) with JOA for the optimal weight selection of DNN network. In the population, improving the fitness value of every solution is the main intention of JOA.

By updating the values, this algorithm efforts the fitness value to shift towards the best solution. It′s dominant over other optimization techniques with respect to low computational complexity and time and faster convergence speed. Also a feedback loop is fed back to segmentation step for improvement.it produce 99% accuracy for training set and 97%accuracy for testing set.

Amit Kumar Singh *et al*.(2015)[5], has done image acquisition from IRRI database or from a high resolution camera. The quality improvement is done using Wiener filter which remove the blurring effect and adaptive thresholding method is used for contrast enhancement. The image is segmented using K means clustering method until the centroid converges; texture features such as entropy and standard deviation are extracted. Finally the classification is done using SVM classifier and obtain an accuracy of 82%.

Minu Eliz Pothen *et al*.(2020)[6] has done image classification on 120 image data set, image is preprocessed by resizing to 640*320 pixels. It uses the Otsu method for segmentation to convert the gray scale image to binary image and separating as background (lesser than threshold) and foreground (greater than threshold). Advantage of Otsu method is its simplicity and using it as a global threshold technique. Features are extracted using two methods. First is LBP (Local binary pattern) in which the surrounding pixels in 3*3 dimension are threshold by central value and hence the binary to decimal conversion and histogram plotting is done to create a new image matrix. Next is the HOG feature descriptor is utilized to detect the structure or shape of an object. It counts the frequency of gradient orientation of small cells, later histogram of gradient orientations in each cell based on the pixels are calculated and separation of each cell into angular bins depends on the gradient orientation. Adjacent cells are grouped as blocks for normalization of histograms. And block histogram represents the feature descriptor. Classification is done with SVM with kernel functions such as linear, polynomial and RBF been used for comparison with HOG and LBP.

Usha Kiruthika *et al*.(2019)[7] has done image filtering using median filtering by calculating the median value and replacing the pixel without degrading the quality. The median filter is more advantageous than the mean filter as it does not create any unrealistic new pixel as in the case of mean filter. Edge detection using Sobel edge detector is used to identify boundary and background subtraction is done by difference operator. Segmentation is done using SLIC (Simple Linear Interactive Clustering) which is based on super pixel based algorithm done on the basis of color intensity. Features such as contrast, energy, correlation and homogeneity are extracted using GLCM. Finally the classification is done using ANN in which the features extracted are compared with training data set in ANN.

5. Results and Discussion

Here the table 1 shows the comparison of different methods and the accuracy rate. It is analyzed that mainly DNN with JOA shows the highest accuracy in classifying rice diseases.

Table1. Comparison of Different Methods

Diseases	Preprocessing Method	Segmentation method	Feature Extraction Method	Features extracted	Classifier	Accuracy
1)Leaf Blight 2)Brown Spot 3)Leaf Smut 4)Leaf Blast	Median filters	Fuzzy Clustering	GLCM	Texture	ANN	94%
1) Rice Blast 2) Brown Spot 3)Sheath Blight	Contrast enhancement	Otsu Thresholding	Blob Analysis	Shape Color	SVM	93%
1)Bacterial Blight 2)Brown Spot	Brightness, Contrast Enhancement	K-means Clustering	-	-	-	Good
1)Leaf Blast 2)Bacterial Blight 3)Sheath Rot 4)Brown Spot	1)Resizing 2)RGB to HSV	K-means Clustering	GLCM	Texture Color	DNN with JOA	Blast -98.9% Bacterial Blight -95.7% Sheath Rot - 92% Brown Spot- 94%
1)Leaf Blast	1)Weiner filter 2)Adaptive Histogram	K-means Clustering	Entropy and Standard Deviation	Texture	SVM	82%
1)Leaf Blight 2) Leaf Blast	Resizing	Otsu Thresholding	LBP HOG	Texture Shape	SVM	94.06%

3) Sheath Blight						
1)Brown Spot 2)Leaf Blast 3)Bacterial Blight	Median filter	SLIC	GLCM	Texture	BPNN	93.33%

6. Conclusion

In this paper, a survey on detection and classification of rice leaf disease using image processing and machine learning techniques and comparison is carried out. Various methods used for preprocessing, segmentation, feature extraction and classification are analyzed. It is found that classification done using DNN with JOA gave a better accuracy in detecting rice diseases.

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CSR spending and the performance of the top CSR contributing companies; An Analysis based on Financial Parameters.

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Abstract

In the present era, Corporate Social Responsibility (CSR) has become important to such an extent that it has been often used as a yardstick by the investors for measuring the performance of the stock. Indian corporate sector nowadays is willing to spend huge amount of money in order to sustain their goodwill before their stakeholders. The amendment of The Companies Act 2013, has made it mandatory for the companies to take up socially relevant CSR activities which have made India, the only nation which has regulated and mandated CSR. This initiative has helped the nation move towards achievement of Sustainable Development Goals (SDGs) and is eventually evolving as an important contributor towards government spending. As per National CSR Data portal, the total number of registered CSR companies comes to 19,933 and the total contributions made by them is 13,465 crores (Rs.) for the Financial Year (FY) 2016-17.

This paper focuses on finding the impact of CSR spending on the performance of the top 10 companies based on their CSR spending for the last 10 years. The variables used for the study are Goodwill, Environmental Social and Governance (ESG) Disclosure scores, Enterprise Value (EV), Beta and share prices.

Keywords: Corporate Social Responsibility, Government spending, Enterprise Value, ESG disclosures.

Introduction

Management and Society is a mutually dependent term which has broad classifications. One interlinking factor between both this concept is Corporate Social Responsibility (CSR). CSR refers to the company's efforts to improve the society by donating money as well as services to non-profit organizations for implementing environment friendly policies in the workplace. It is very important for the companies, non-profits, and employees of an organization to contribute towards the society, environment, country, and so on. CSR has a major role on the performance of the company. Businesses which focus to continue serving the society and its stakeholders contribute a portion of their profits as CSR every year. Companies Act 2013 mandates that companies with a net worth of more than 500 crores or revenue of more than 1,000 crores or net profit of more than 5 crores must spend at least 2% of their average net profit of the preceding three years on CSR activities.

Tata Group of Companies is well known in the market for their contributions to the society through CSR spending. The Tata group spends about 1,000 crores annually on its CSR work and even has a dedicated unit, Tata Sustainability Group, which addresses key environmental issues related to water, carbon and waste.

Companies nowadays concentrate more on their CSR spending not only to abide by the law but also to participate in the development process of the economy. As per National CSR Data portal, the total number of registered CSR companies comes to 19,933 and the total contributions made by them is 13,465 crores (Rs.) for the Financial Year (FY) 2016-17.

This paper focuses on finding the impact of CSR spending on the performance of the top 10 companies based on their CSR spending for the last 10 years. The companies were chosen based on their CSR spending during the financial year 2016-17. The study is on finding the contributing factors which impact the growth of

CSR spending made by the companies. The variables used for the study are Goodwill, Environmental Social and Governance (ESG) Disclosure scores, Enterprise Value (EV), Beta and share prices.

Review of Literature

Dornean and Oanea (2017)-This paper evaluated the relationship between Corporate Social Responsibility(CSR) and stock prices for the companies listed on Bucharest Stock Exchange (BSE) in 2015.It also investigates the difference in the market stock prices of companies. It highlights that stock return has a significant impact on CSR activities of a company.

Te Lee (2016)-This paper discussed about an endogenous relationship between CSR and stock price crash risk. Researchers have used two-stage least squares regression analysis to address the bias and inconsistency associated with endogeniety issues. The empirical results showed that CSR significantly mitigates Taiwanese stock price crash risk. This finding is consistent with the notion that socially responsible Taiwanese firms commit to a higher standard of transparency and engage in less hoarding, thus reducing crash risk. The empirical results also show that CSR has a more pronounced effect in mitigating crash risk for Taiwanese firms with less effective corporate governance

Fiori, Donato and Izzo (2015) This article on the CSR strategy studied about how the companies can integrate the social responsibility into their strategy. This study investigated the impact of corporate social performance on the stock prices of Italian listed companies. It focused on the relationship between the CSR and financial performance, showing contradictory results about the company in a widely shared portion. They chose stock prices as a proxy for financial performance, in order to measure the perception and reaction of financial markets to the company's socially responsible behaviors. Different social parameters like concerning environment, community and employment activities which has a negative influence on the stock prices in the Italian Stock Market were also considered. The Italian investors perceived these practices as avoidable expenses reducing shareholder's income and companies value and recognition thereby giving a negative market premium, in terms of lower stock prices to socially responsible enterprises.

Johansson, Karlsson and Hagberg (2015)-Conducted an investigative study by examining the Stockholm OMX stock exchange and analyzing the relationship between Corporate Social Responsibility and financial performance of companies in terms of CSR activities. It also did a longitudinal research aimed at investigating the commonly applied map changes in business and management research.

Zacchaeus, Oluwagbemiga and Olubenga (2014)-Evaluated the effects of CSR on stock prices of listed manufacturing companies in Nigeria.

Dinsmore (2014)- The purpose of their study was to examine the extent and nature of the collective relationship between CSR, proxied by the 2013 Best Corporate Citizens index, and corporate financial performance, proxied by an equal weight of Tobin's Q. The Stakeholder theory provided the framework for this study.

Zaccheaus, Oyerogba, Oluwagbemiga and Michael Olubenga (2014)-Their study investigated the effect of Corporate Social Responsibility Performance on the stock prices of Nigerian listed manufacturing companies. Its objective was to carry an empirical study on the relationship between CSR performance and stock price of listed manufacturing companies and also measure the performance in terms of money contributions made or expenditure that incurred by the companies and find out its improvement in respect of firm's corporate social responsibility activities concerning environment, community, and employment activities.

Flammer (2012) examined that the environmental corporate social responsibility generates new and competitive resources for firms. The companies which had reported to behave responsibly towards the

environment experienced a significant stock price increase whereas firms that did not report so faced a significant stock price decrease. It positioned that the value of environmental CSR depends on external and internal moderators.

Donato and Izzo (2012)- investigated the impact of Corporates Social Performance on the stock prices of Italian listed companies. The study focused on the relation between Corporate Social Responsibility and financial performance and the idea behind the attempt to measure the perception and reaction of financial markets to the companies "socially responsible behavior". Study found that Italian investors perceive these practices as avoidable expenses reducing the shareholder's income and companies value and recognize a negative market premium, in terms of lower stock prices to socially responsible enterprises.

Significance of the Study

The Companies Act 2013 amendments have made the norms of corporate social responsibility stringent as the policy makers are expecting CSR spending by the corporate to be a major source for the developmental activities of the economy. Hence it is essential to understand how the various stakeholders react to the increased CSR spending. This study primarily focuses on that aspect.

Objectives

- To find out the impact of CSR spending on the share prices and Beta of the selected companies.
- To understand the relationship between CSR spending and goodwill of the selected companies.
- To analyze the connection between ESG disclosure scores and CSR spending.
- To understand the relationship between enterprise value and CSR spending of the selected companies

Hypotheses

H01 – There is no relationship between CSR spending and stock price movement of the company.
H02 – There is no relationship between CSR spending and beta.
H03 –There is no relationship between CSR spending and goodwill of the company.
H04 –There is no relationship between CSR spending and Enterprise value of the company.
H05 –There is no relationship between CSR spending and ESG disclosure scores of the company.

Research Methodology

Research type

The research is descriptive in nature.

Sources of Data

The data is collected using secondary sources as mentioned.

- Companies were selected based on the reports published by the National CSR Data portal.
- Stock prices – NSE website
- Goodwill, ESG disclosure, Enterprise value – Bloomberg Terminal
- CSR spending – Ministry of Corporate Affairs website.

Time period

Financial year 2014-15, 2015-16 & 2016-17.

Tools used

Beta

A beta coefficient is a measure of the volatility, or systematic risk, of an individual stock in comparison to the unsystematic risk of the entire market. In statistical terms, beta represents the slope of the line through a regression of data points from an individual stock's returns against those of the market. Beta is used in the capital asset pricing model (CAPM), which calculates the expected return of an asset using beta and expected market returns.

$$\text{Beta coefficient}(\beta) = \frac{\text{Covariance}(R_e, R_m)}{\text{Variance}(R_m)}$$

where:

R_e = the return on an individual stock

R_m = the return on the overall market

Covariance = how changes in a stock's returns are related to changes in the market's returns

Variance = how far the market's data points spread out from their average value

Correlation

Correlation is a statistic which measures the degree to which two securities move in relation to each other. Correlations are used in portfolio management, computed as the correlation coefficient, which has a value that must fall between -1.0 and +1.0.

A perfect positive correlation means that the correlation coefficient is exactly 1. This implies that as one security moves, either up or down, the other security moves in lockstep, in the same direction. A perfect negative correlation means that two assets move in opposite directions, while a zero correlation implies no relationship at all.

$$r = \frac{\sum(X - \overline{X})(Y - \overline{Y})}{\sqrt{\sum(X - \overline{X})^2}\sqrt{(Y - \overline{Y})^2}}$$

where:

r = the correlation coefficient

$\overline{X}$ = the average of observations of variable

XY = the average of observations of variable Y

Regression

Regression is a statistical measurement used in finance, investing, and other disciplines that attempts to determine the strength of the relationship between one dependent variable (usually denoted by Y) and a series of other changing variables (known as independent variables).

Linear regression: $Y = a + bX + u$

Multiple regression: $Y = a + b1X1 + b2X2 + b3X3 + ... + btXt + u$

Where:

Y = the variable that you are trying to predict (dependent variable).

X = the variable that you are using to predict Y (independent variable).

a = the intercept.

b = the slope.

u = the regression residual.

Durbin Watson Test

The Durbin Watson Test is a measure of autocorrelation (also called serial correlation) in residuals from regression analysis. Autocorrelation is the similarity of a time series over successive time intervals. It can lead to underestimates of the standard error and can cause you to think predictors are significant when they are not.

The Hypothesis for the Durbin Watson test are:

H0 = no first order autocorrelation.

H1 = first order correlation exists.
(For a first order correlation, the lag is one time unit).

Assumptions are:

- That the errors are normally distributed with a mean of 0.
- The errors are stationary.

The test statistic is calculated with the following formula:

$$DW = \frac{\sum_{t=2}^{T}(e_t - e_{t-1})^2}{\sum_{t=1}^{T} e_t^2}$$

Key Findings

The analysis was done by comparing the CSR spending of the top 10 companies and their relationship with various parameters measuring company performance.

Table 1: Correlation Matrix

Correlation

		CSR	STOCKPRICE	BETA	GOODWILL	ESGDISCLOSURE	ENTERPRISE VALUE
CSR	Pearson Correlation	1	.253	-.353	.408*	.469**	.710**
	Sig. (2-tailed)		.177	.055	.025	.009	.000
	N	30	30	30	30	30	30
STOCKPRICE	Pearson Correlation	.253	1	-.471**	-.086	.426*	.586**
	Sig. (2-tailed)	.177		.009	.651	.019	.001
	N	30	30	30	30	30	30
BETA	Pearson Correlation	-.353	-.471**	1	.064	-.659**	-.653**
	Sig. (2-tailed)	.055	.009		.737	.000	.000
	N	30	30	30	30	30	30
GOODWILL	Pearson Correlation	.408*	-.086	.064	1	.288	.278
	Sig. (2-tailed)	.025	.651	.737		.123	.137
	N	30	30	30	30	30	30
ESGDISCLOSURE	Pearson Correlation	.469**	.426*	-.659**	.288	1	.722**
	Sig. (2-tailed)	.009	.019	.000	.123		.000
	N	30	30	30	30	30	30
ENTERPRISE VALUE	Pearson Correlation	.710**	.586**	-.653**	.278	.722**	1
	Sig. (2-tailed)	.000	.001	.000	.137	.000	
	N	30	30	30	30	30	30

Source: Author's data

*. Correlation is significant at the 0.05 level (2-tailed).

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

- From the analysis, it was found that the CSR spending of the companies is positively related to factors such as Goodwill, ESG Disclosures and Enterprise Value with a level of significance of 0.05, 0.01 and 0.01 respectively.
- There exists a positive correlation between stock price, ESG Disclosure and Enterprise Value.
- The beta shows a negative correlation with variables like Stock price, ESG Disclosure and Enterprise Value.
- It is also found that there is no relationship between CSR spending and beta value.
  Hence it is concluded the Goodwill, ESG Disclosure score and Enterprise Value of the company is impacted by the CSR spending.
  Thus the below listed hypotheses are rejected.
  - H03 –There is no relationship between CSR spending and goodwill of the company.
  - H04 –There is no relationship between CSR spending and Enterprise value of the company.
  - H05 –There is no relationship between CSR spending and ESG disclosure scores of the company.

Regression analysis

Table 2: Regression Analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.710[a]	.504	.486	115297.82909	1.828

a. Predictors: (Constant), CSR

b. Dependent Variable: ENTERPRISE VALUE

Source: Author's calculation

Table 3: Regression Analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.469[a]	.220	.192	10.85426	.220	7.898	1	28	.009	2.223

a. Predictors: (Constant), CSR

b. Dependent Variable: ESG DISCLOSURE

Source: Author's calculation

Table 4: Regression Analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.408[a]	.166	.137	4916.74415	.166	5.585	1	28	.025	2.215

a. Predictors: (Constant), CSR

b. Dependent Variable: GOODWILL

Source: Author's calculation

- From the regression analysis, it is proved that 50.4% of Enterprise value is influenced by the CSR spending of the company. The Durbin Watson score nearing 2, proves that the model does not have autocorrelation which makes the model reasonable.
- The CSR spending has influenced 19.2% of ESG disclosure and 13.2 % of goodwill. The Durbin Watson score of 2 and above concludes that the model has a negative auto correlation.

Suggestions

- Enterprise Value and Goodwill of the companies are increasing as a result of increased CSR spending. The CSR spending is definitely a factor which emphasizes on the social commitment of the company and is thereby attracting the stakeholders to the company which in turn is increasing its market value.
- The CSR Spending and its disclosures are boosting the investor sentiments and the companies are able to amass funds from the market as the investors are viewing the companies as ethical and socially responsible.

Scope for further studies

The topic was primarily taken to analyze whether the CSR spending is having any relationship with other financial parameters. This study was able to conclude that there exists certain relationship between various variables. Hence, it is suggested that a study on a much higher scale needs to be done and the author plans to do an in-depth study with more data sets and variables in the near future.

Limitations of the study

- Lack of data on CSR Spending was a major hindrance.
- Since companies started publishing the CSR data only after the revised Companies Act norms, it was difficult to study the past trends of the CSR and related variables.

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Platform/Database used:

Bloomberg Terminal

Application of Random Forest For Robust Prediction Of Social Media Comments: A Case Approach

Thangaraja Arumugam, Vignesh Karthik &Ameena Babu

Abstract

The measure of information that gets added to the system builds step by step and it is a gold mine of analysts who need to comprehend the complexities of client conduct and client commitment. Right now, we examine one such issue where we make a stride towards understanding the profoundly unique conduct of clients towards Social media platform posts. The objective is to anticipate what number of comments a client created present is normal on get in the given arrangement of hours. We have to show the client comments design over a lot of factors which are given and get to the correct number of comments for each post with least blunder conceivable. The assessment has revealed that a noteworthy piece of the comment volume of a post is directed by the features of that post's Social media platform page and is respectably arbitrary to inherent features of the post. Overall, this examination would assist the associations with understanding the clients conduct on posting remarks in social media platform in different days and different timings just as the factors affecting their remarking design. With these data, they can foresee the perceivability of their notice. To maintain a strategic distance from an inappropriate planning for causing commercial with the goal that cost to can be spared. Greatest reach can be accomplished

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Evaluation of Frequent Itemset Mining Algorithms - priori and FP Growth

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***Abstract*- Nowadays the Frequentitemset mining (FIM) is an essential task for retrieving frequently occurring patterns, correlation, events or association in a transactional database. Understanding of such frequent patterns helps to take substantial decisions in decisive situations. Multiple algorithms are proposed for finding such patterns, however the time and space complexity of these algorithms rapidly increases with number of items in a dataset. So it is necessary to analyze the efficiency of these algorithms by using different datasets. The aim of this paper is to evaluate theperformance of frequent itemset mining algorithms, Apriori and Frequent Pattern (FP) growth by comparing their features. This study shows that the FP-growth algorithm is more efficient than the Apriori algorithm for generating rules and frequent pattern mining.**

***Keywords*- Frequent itemset mining, Apriorialgorithm, FP-growth algorithm, Weka, Association Rule.**

I. INTRODUCTION

These days the size of databasesincreasesrapidly, this leads to invention of different tools to extract information automatically from the large database. Many researchers used data mining or knowledge discovery in database (KDD) to extract innovative and frequent pattern from large databases or transactional databases.

Frequent itemset mining has been applied in a great number of fields, including intrusion detection, Market basket analysis and credit card fraud prevention to discover unpredicted association among itemset in transactional and relational database.Frequent pattern Mining or association mining shows which items appear together in a transaction or relation.

Frequent patterns are patterns such as subsequences, itemsets or substructures that appears in a data set frequently. Finding such frequent pattern plays an essential role in mining association, correlations, and many other relationships among the data. It also helps in data classification, clustering and other data mining tasks as well. Thus, frequent pattern mining has becomes an important data mining task and a focused theme in data mining research [1].

II. LITERATURE REVIEW

Much research work has been done to compare different algorithms used for frequent itemset. In the paper 'Survey on Frequent Item set Mining Algorithms' [2] Pramod S and O.P. Vyas conducted a survey on frquent itemset mining algorithms. They used Adult and Mushroom dataset for evaluating the performance of different algorithm. This study comprises features like different support values, size of transactions and different datasets. They concluded that SaM algorithm performed better in all data set.

In [3] M.S Mythili, A.R Mohamed Shanavas conducted a Performance Evaluation of Apriori and FP-Growth Algorithms by comparing the capabilities of these algorithms. The study show that FP-growth algorithm is more efficient than the Apriori algorithm.

In [4] Mr.Rahul Shukla, Dr. Anil kumar Solanki conducted a performance Evaluation for Frequent Pattern mining Algorithm. In the paper they compared the performance of Apriori and ECLAT Algorithm on medical data and they concluded that the Eclat approach is more efficient for mining frequent patterns in a large database.

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In the paper 'Algorithms for frequent itemset mining: a literature review' Chin-Hoong Chee, JafreezalJaafar, Izzatdin Abdul Aziz, MohdHilmi Hasan & William Yeoh reviewedthe strengths and weaknesses of the important and recent algorithms in Frequent Pattern Mining and they identified two major problem with frequent pattern mining. They mentioned that frequent hidden pattern mining needs more time and memory space [5].

In the paper[6]' Frequent Itemsets Mining for Big Data: A Comparative Analysis'DanieleApiletti,ElenaBaralis,TaniaCerquitelli,PaoloGarza,FabioPulvirenti and LucaVenturini conducted a theoretical and experimental comparative analyses of Hadoop- and Spark-based scalable algorithms to find frequent pattern from big data.

In [7] Ravi Ranjan and Aditi Sharmathey compared Hadoop, Spark, Flink by using Apriori and Fp-Growth on different dataset. They suggested that Flink is performing better in the field of big data.

III. FREQUENT PATTERN MINING(FPM) AND ALGORITHMS

In data mining tasks, the frequent item sets plays an important role for finding frequent pattern or association from various kinds of databases like relational database, transactional database etc. FPM plays an essential role for clustering, classifying and identifying outliers a set of data. Apart from this, FPM has many applications like spatiotemporal data analysis, biological data analysis, and software bug detection [8].

FPM is used to predict the occurrence of a specific item based on the occurrence of other items in the transaction. The terminologies used in frequent pattern mining are support and confidence. Support specifies how frequently an itemset appears in the dataset and the confidence describes how often the rule has been found to be true. The support and confidence are defined as:

$$\text{Support}(A \Rightarrow B) = P(A \cup B)$$

$$\text{Confidence}(A \Rightarrow B) = \frac{\text{Support}(AUB)}{\text{Support}(A)}$$

The rule is considered as strong if it satisfies a minimum support threshold and a minimum confidence threshold. The methods used in frequent item set mining are

- Finding Frequent itemsets using candidate generation
- Mining Frequent itemsets without candidate generation
- Mining Frequent itemsets using Vertical Data format.

A.

APRIORI Algorithm

R.Ararwal and R.Srikant proposed this algorithm in 1994 for mining frequent itemsets for Boolean association rule [1]. It uses candidate generation for finding frequent itemsets. Aprioriis an iterative approach, where k-itemsets are used to find (k=1)-itemsets. This algorithm uses Apriori property to reduce the search space. It is a two-step process called join and prune.

Join step - To find L_k, a set of k-itemset is generated by joing L_{k-1} with itself.

Prune step - Scans the count of each item. If it less than minimum support then it does not considered as frequent.

Apriori Algorithm Pseudocode

```
Procedure Apriori(D, minSupport)   // D – database, minsupport- Minimum support
{
L1 = {frequent items};
For (k= 2; Lk-1! =∅; k++)
{
        Ck= candidates generated from Lk-1
        For each transaction t in database do
        {
                Increment all candidates
                Lk = candidates in Ck with
                minSupport
        }
}
ReturnCkLk;
}
```

B. FP-Growth Algorithm

The main disadvantages of Apriori algorithm are it generates huge number of candidate sets and this algorithm repeatedly scans the database and checks a large number of candidates by pattern matching. Hence it is very costly. To overcome these

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disadvantages, the next method for generating frequent itemset without using candidate generation is FP-Growth. FP-Growth uses a divide and conquer approach. It first compresses the database into FP-Tree and then divides these compressed database into a set of conditional database.

FP-Growth Algorithm

Step1: Scan the database to get set of frequent itemsetand their support count.
Step2: Sort the frequent itemset in descending order using support count.
Step3: Construct FP-tree. Initially it creates the root of the tree and labelled as 'Null'.
Step4: Construct the FP-conditional tree for each item (or itemset)
Step5: Determine the frequent patterns.

IV. DATASETS AND RESULTS

We have used supermarket data set and vote datasets from 'storm.cis.fordham.edu' for comparing two frequent pattern mining algorithms. The first data set is 'Super Market Data Set (SMDS)' [9], which contains 4627 instances and 217attributes. The second one is 'Vote Data Set (VDS)' [9], which consists of 435 instances and 17 attributes. In this comparative study, twofrequent itemset mining algorithms are used. They are Apriori and FP growth.

Initially, the datasets are preprocessed and afterthat the algorithms are applied. The following figures shows the results obtained from weka after preprocessing. Fig.1 shows the result obtained after preprocessing the dataset 'SMDS.

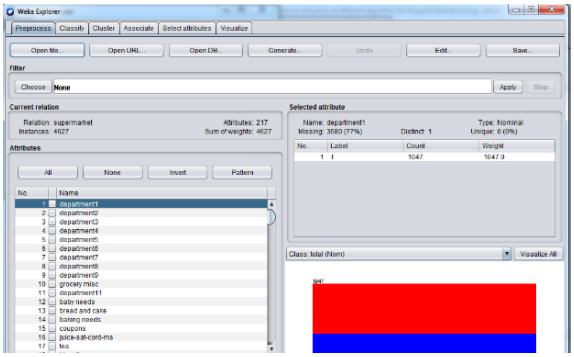

FIG.1. PREPROCESSING RESULT – SMDS

Fig.2 shows the result obtained after preprocessing the dataset 'VDS'.

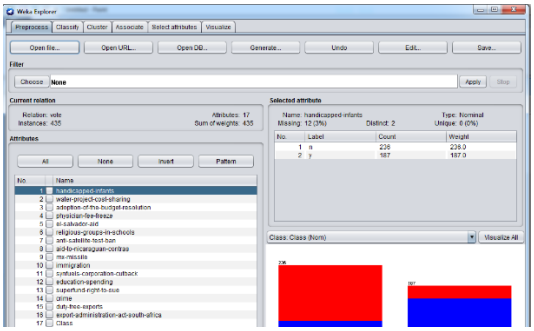

FIG.II. PREPROCESSING RESULT – VDS

The following figures shows the output obtained from Apriori and FP growth algorithms.Fig3 shows the rules generated by Apriori algorithm in SMDC dataset. Ten rules are generated based on support and confidence.

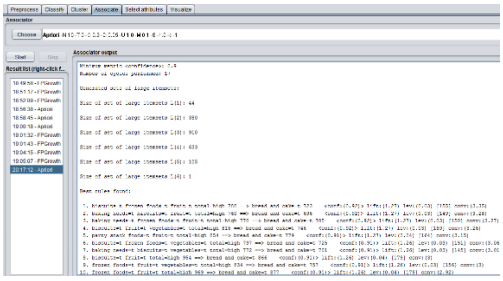

FIG.III. THE RULES GENERATED BY APRIORI ALGORITHM IN SMDC DATASET

Fig.4 shows the rules generated by Apriori algorithm in VDS. Ten rules are generated based on support and confidence.

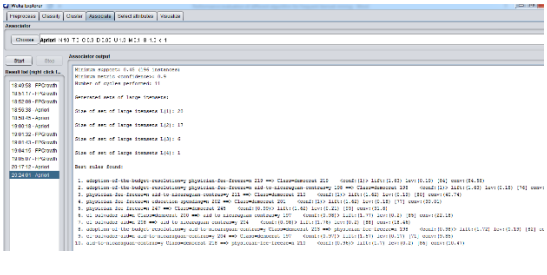

FIG.IV. THE RULES GENERATED BY APRIORI ALGORITHM IN VDS

The rule generated by FP-Growth using vote data set is shown in Fig 5. FP Growth found 41 rules in vote dataset and only the top 10 rules are displayed in the following figure.

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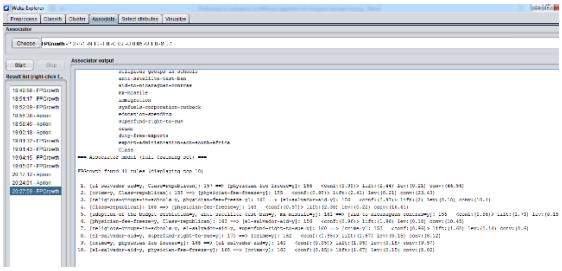


FIG.V. THE RULE GENERATED BY FP-GROWTH USING VOTE DATA SET

Fig 6 shows the rules generated by FP Growth in SMDC data set. FP Growth found 16 rules in vote data set and only the top 10 rules are displayed in the following figure.

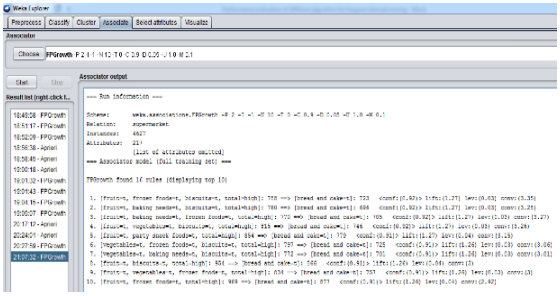


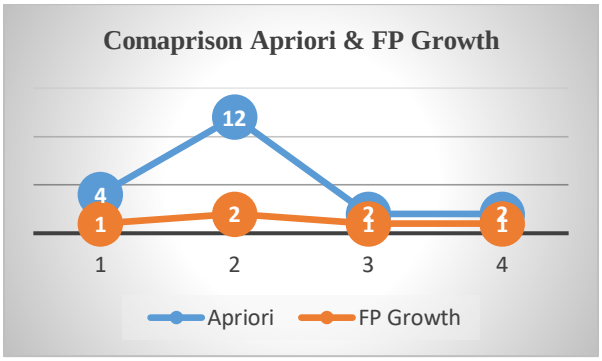
FIG. VI. THE RULES GENERATED BY FP GROWTH IN SMDC DATA SET

V. COMPARISON OF RESULTS

This section deals the comparison part of Apriori and FP Growth algorithms. The table1 shows the time needed to generates rules by using Apriori and FP Growth.Compared to Apriori the FP Growth algorithm takes less time to generate the rules in both datasets. In the supermarket dataset,Apriori algorithm took 4 seconds to produce the rules when minimum support is 0.15. But FP growth algorithm generated the rules within in a second. In the case of vote dataset FP Growth performed better than the Apriori algorithm.

Instances	Attribute	Minimum support	Time Taken (in Sec)	
			Apriori	FP Growth
SupperMarket (4627)	217	0.15	4	1
		0.2	12	2
Vote(435)	17	0.15	2	1
		0.2	2	1

TABLE 1- COMPARISON RESULTS



VI. CONCLUSION

In many data mining applications, association rule plays an important role for finding frequent pattern. In this study we observed that FP Growth algorithm is better than the Apriori algorithm. In both datasets the FP growth taken less time to generate the rule. FP-growth is more acceptable for larger databases.

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Articles

Implications & Opportunities of Prompt Corrective Action on Private sector Banks

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Abstract: Prompt corrective action framework is a measure or tool to maintain the sound financial health of banks which involve monitoring of certain performance indicators of banks. PCA is a guideline action brought out by the Reserve bank of India if in case the commercial banks financial condition worsens below a specific standard. Recently many of the public sector banks were put under the PCA Framework by the RBI. And following this framework the banks are under certain restrictions with regards to its operations. So these public sector banks have to reduce their activities and can only lend to those companies which are above a certain investment grade. And this framework provides an opportunity to private sector banks to increase their operations and lending activities and ultimately gain market share. The study thus gives an understanding regarding the PCA framework, what are the factors or trigger points used to analyze banks performance.

Key Words: Recapitalization, Turnover, Threshold, Credit Rating, Capital Adequacy Ratio.

Article History

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Introduction

The Prompt Corrective Action was initiated in the year 2002. The guidelines of the framework has been issued on April 13 2017 which is a revised version of the Framework. The revised framework of PCA will be reviewed after 3 years. The PCA framework is applicable only to commercial banks and not extended to co-operative banks, non-banking financial companies (NBFCs). The Reserve Bank has specified certain regulatory trigger points, as a part of prompt corrective action (PCA) Framework, in terms of three parameters, i.e. capital to risk weighted assets ratio (CRAR), net non-performing assets (NPA) and Return on Assets (RoA), for initiation

of certain structured and discretionary actions in respect of banks hitting such trigger points. Based on each trigger point, the banks have to follow a mandatory action plan. Apart from this, the RBI has discretionary action plans too. The rationale for classifying the rule-based action points into "mandatory" and "discretionary" is that some of the actions are essential to restore the financial health of banks while other actions will be taken at the discretion of RBI depending upon the profile of each bank.

PCA is only a tool under its supervisory framework to maintain sound financial health of banks. PCA is used to monitor certain performance indicators of the banks as an early warning exercise and has initiated such thresholds as relating to capital, asset quality etc. are breached. This helps the banks to have good financial health and also gives an opportunity to the RBI to have focused attention on these banks by engaging with the management more closely in those areas. Under the PCA framework the RBI's role is not just advisory but it can push banks to change that may be necessary to reduce the stress on the balance sheet of banks. Once the PCA is triggered the banks are not allowed to renew or access costly deposits or take steps to increase their fee-based income. Banks will also have to launch a special drive to reduce the stock of NPAs and contain generation of fresh NPAs. They will also not be allowed to enter into new lines of business. RBI will also impose restrictions on the bank on borrowings from interbank market.

The Implementation of PCA by RBI is good for private sector banks as they have the opportunity to capture the market and increase their market share and increase their activities and operations. Currently the number of banks under PCA is 11 and all are public sector banks. Thus this gives the private sector banks an opportunity to expand their operations and also gain market share. This study mainly gives an understanding regarding the PCA Framework, which are the banks which comes under this PCA Framework and what are the implications and opportunities for Private sector banks with regards to increasing their customer base.

Statement of the Problem

In India, 11 out of 21 Public sector banks is put under the Prompt Corrective Action framework by the RBI which is a good opportunity for Private Sector Banks as the banks which come under the PCA Framework are all public sector banks and have to face restrictions on their operation. So this study is an attempt is made to understand about the PCA Framework and its opportunities.

Objective and methodology of the study

Objectives of Study

- To understand PCA Framework and list of banks under the framework.
- To analyze the clients of PCA Banks and shortlist the companies based on Credit Rating.
- To shortlist companies which are worth lending by the bank according to the banks standard.

Methodology

The Nature of the study is Descriptive. Descriptive research is used to describe characteristics of a population or phenomenon being studied. The main two sources of data collection are Primary source and secondary source of Data. The primary source of data collected for the study is mainly through interaction with company officials. The secondary source of data is collected from different websites like Probe, CRISIL, ICRA etc.

Data Analysis & Interpretation

In the process of analyzing the Prompt Corrective Action Framework, the main trigger points considered by RBI are CRAR (Capital to Risk Assets Ratio); NPA's (Non- Performing Assets); ROA (Return on Assets).The Data collected from various sources is analyzed with the help of Excel sheet. The three trigger points are very much important for deciding the banks which comes under the PCA Framework.

The factors in the prompt corrective action. The first factor is Capital Adequacy Ratio. It is a measure of a bank's capital. Two types of capital are measured: tier one capital, which can absorb losses without a bank being required to cease trading, and tier two capital, which can absorb losses in the event of a winding-up and so provides a lesser degree of protection to depositors. Capital adequacy ratios ensure the efficiency and stability of a nation's financial system by lowering the risk of banks becoming insolvent.

Table 1

PCA indicators and risk thresholds-CRAR

CRAR- Minimum regulatory prescription for capital to risk assets ratio	<10.25% but >=7.75%,	Risk threshold 1
	<7.75% but >=6.25%	Risk threshold 2
	<3.625%	Risk threshold 3

The second factor is the asset quality which is defined as the Net Non-Performing assets. A Non-performing asset (NPA) is a loan or advance for which the principal or interest payment remained overdue for a period of 90 days. Many public sector banks are under the framework of PCA because of high NPA's.

Table 2

PCA indicators and risk thresholds-NPA

Net Non-Performing Assets	>=6.0% but <9.0%.	Risk threshold 1
	>=9.0% but < 12.0%.	Risk threshold 2
	>=12.0%.	Risk threshold 3

The third factor is Profitability for which the Return on Assets is considered as benchmark. ROA is an indicator of how profitable a company is relative to its total assets. ROA gives an idea as to how efficient management is at using its assets to generate earnings. These public sector banks are under PCA due to the negative return on assets.

Table 3

PCA indicators and risk thresholds-ROA

Return on Assets (ROA)	Negative for two consecutive years	Risk threshold 1
	Negative for three consecutive years	Risk threshold 2
	Negative for four consecutive years.	Risk threshold 3

So based on all these 3 Trigger points 11 out of 21 Public Sector banks were put under the PCA Framework. These PCA Banks include:

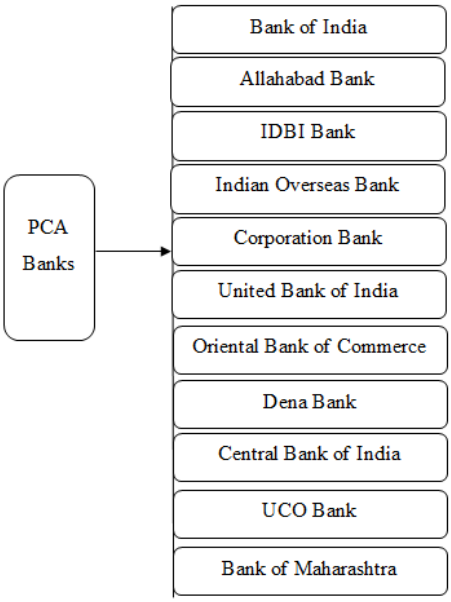

Fig.1 List of banks under PCA framework

When the PCA is triggered on a bank it has certain restrictions on its operations. Now all of these 11 banks has to follow these restrictions put up under this Framework. The banks cannot access costly deposits, there is a need to reduce the stock of NPA's, there is restriction on opening new branches, recruitment of employees, dividend payment and also increment given to employees. Also the banks can disburse loans only to those companies whose borrowing is above a certain investment grade. The investment grade shows the quality of a company's credit. According to PCA framework there are certain capital categories which includes Undercapitalized, Significantly Undercapitalized, and Critically Undercapitalized. The banks which is under significantly and critically undercapitalized are restricted to pay compensation to senior executive officers which is a mandatory restriction. In extreme cases the banks may be subjected to amalgamation, reconstruction & winding up. It also has the provision to cap the bank's lending limit to one entity or sector.

Table 4

Key indicators of PCA framework for PCA Banks

Name of Banks	CRAR	NET NPA	ROA
Bank of India	12%	7%	-0.24%
Allahabad Bank	11%	9%	-0.13%

IDBI Bank	11%	13%	-1.42%
Indian Overseas Bank	11%	14%	-1.38%
Corporation Bank	11%	8%	0.22%
United Bank of India	8%	10%	0.15%
Oriental Bank of Commerce	12%	9%	-0.43%
Dena Bank	11%	11%	-0.66%
Central Bank of India	11%	10%	-0.73%
UCO Bank	11%	9%	-0.79%
Bank of Maharashtra	11%	12%	-0.86%

According to NPAs Risk Thresholds, Banks which come under Risk Threshold 1 are Bank of India and Corporation Bank. So these banks will have to follow restrictions such as Restriction on dividend distribution/remittance of profits. The Promoters/owners/parent in the case of foreign banks to bring in capital.

Under Risk Threshold 2, the banks include Allahabad Bank, United Bank of India, Oriental Bank of Commerce, Dena Bank, Central Bank of India, UCO Bank. In addition to mandatory actions of Threshold 1, these banks will have Restriction on branch expansion; domestic and/or overseas. Higher provisions as part of the coverage regime.

Under Risk Threshold 3comes Bank of Maharashtra, Indian Overseas Bank, IDBI Bank. These Banks in addition to mandatory actions of Threshold 1, there will be Restriction on branch expansion; domestic and/or overseas.

Table 5

List of Prospective clients

Location	Company Name	Total Debt	Revenue	PAT	Credit Rating
Bangalore	Puravankara Limited	2772.01	983.49	77.49	ICRA BBB+
Bangalore	United Spirits Limited	1573.74	25398.8	169.9	ICRA AA
Chennai	Rane(madras) limited	459.18	860.91	14.09	ICRA A
Chennai	TTK Healthcare limited	28	518.87	22.67	ICRA A+

Hyderabad	NCC Limited	13448.49	8325.16	238.81	ICRA A-
Hyderabad	NAVA Bharat Ventures limited	1390.85	989.27	111.22	CARE BBB+
Hyderabad	HBL Power systems limited	935.41	1288.36	19.43	IND BBB+
Hyderabad	Sanghi Industries Limited	776.83	997.53	63.14	ICRA A-
Coimbatore	K.P.R. Mill Limited	1853.67	1961.27	155.54	CARE AA-
Coimbatore	Bannari Amman sugars limited	1137.43	1751.79	145.17	CARE A+
Coimbatore	ELGI Equipments limited	408.21	869.13	23.78	CRISIL AA

The above shows the list of prospective clients that are available for IDFC Bank. There are totally 70 companies in number. Due to confidentiality the names of 11 companies can be provided. The names of these companies were identified by accessing probe website. A list of companies whose sum of charges which were above 10 crore were identified. The credit rating of all these companies were identified from CRISIL, ICRA, CARE and India Ratings. The ratings ranged from A+ to D. Out of the whole list the companies whose credit rating was BBB+ and above were narrowed down. And based upon Revenue (above 250crore) and PAT positive the companies were shortlisted.

Table 6

List of existing clients

Location	Company Name	Total Debt	Revenue	PAT	Credit Rating
Bangalore	Sobha limited	4131.91	1803.34	136.92	ICRA A+
Bangalore	Tata elxsi limited	112.26	1075.21	154.81	ICRA AA
Bangalore	Mangalore chemicals and fertilisers limited	2297.4	2487.47	19.41	CARE BBB
Chennai	E.I.D Parry (india) limited	2986.35	15398	13.94	CRISIL AA-

Chennai	The india cements limited	4967.98	4226.85	137.81	CARE A-
Chennai	Redington (india) limited	1057	12638.73	188.9	ICRA AA

The tables above includes names of the final list of companies which were identified. There are totally 84 companies in number. Out of which 70 are prospective clients for IDFC Bank and 14 are already existing clients of the bank. From all the 6 cities, Chennai is the city which has the largest list of companies.

Credit Rating. A credit rating is an assessment of the creditworthiness of a borrower in general terms or with respect to a particular debt or financial obligation. Standard & Poor's, for instance, has a credit rating scale ranging from AAA (excellent) and AA+ to C and D.

The main Credit Rating agencies in India include: Credit Rating and Information Services of India Limited (CRISIL); Investment Information and Credit rating agency (ICRA); Credit Analysis & Research Ltd. (CARE); India Ratings and Research (IRR).

All the above companies have been rated by all these four agencies. For easy analysis and interpretation the credit ratings have been categorized into 3 ranges: BBB TO BBB+; A- TO A+; AA- TO AA+.

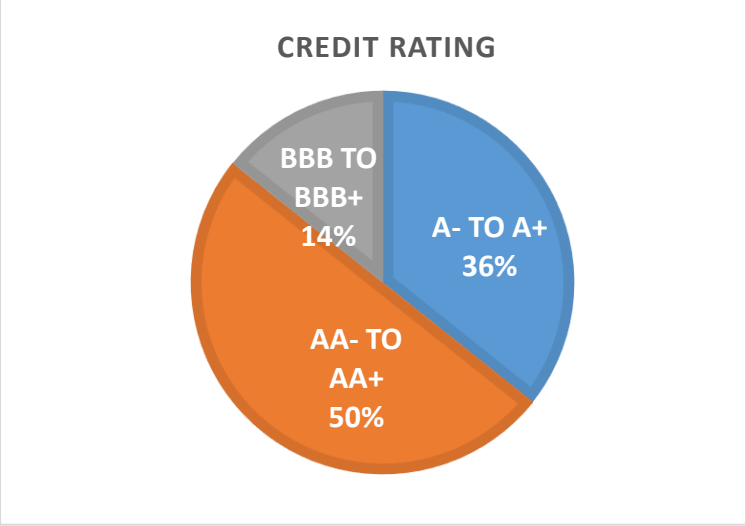

Figure 2

Pie chart representing the credit rating range of existing clients

From the above pie chart it is understood that the majority share of the credit rating of existing clients lies in AA- TO AA+ which is 50%. It infers that IDFC Bank lends to those clients which has a good credit rating. Lending to a good credit Rating company will ensure that the CRAR of the company is adequate.

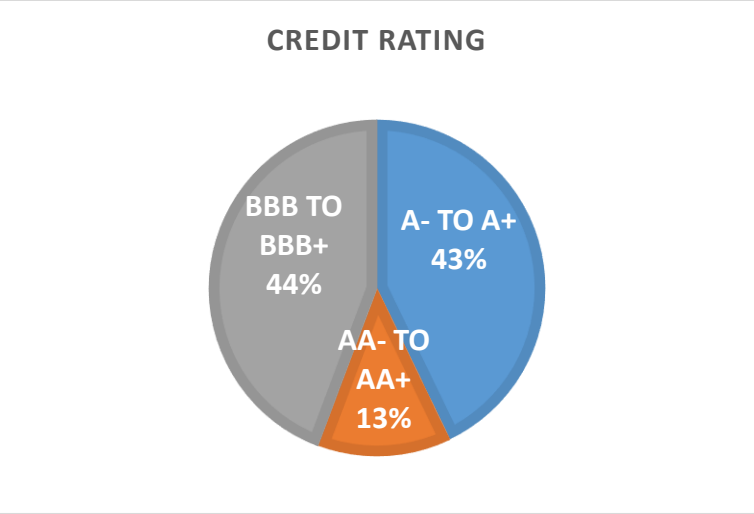

Figure 3

Pie chart representing the credit rating range of Prospective clients

The above pie chart shows the credit rating range of the prospective clients of IDFC Bank. The number of companies available in the range of BBB TO BBB+ is 31. Out of the prospective clients the majority share lies with BBB TO BBB+. The PCA Banks to come out of all the risk thresholds they have to lend to companies above a certain investment grade, which in turn gives IDFC bank the opportunity to lend to the companies which have a rating of BBB TO AA+.

Result and Decision

The major findings of the study are as follows: There are mainly 11 public sector banks which are placed under the PCA Framework by the RBI. The revised version of the framework has been issued on April 13 2017. This PCA Framework is applicable only to commercial bank and not extended to co-operative bank and non-banking financial companies. The RBI has specified regulatory points in term of 3 parameter, i.e. CRAR, NPA and ROA. By taking these parameters into consideration 11 out of 21 public sector banks falls under this framework. All these banks fall under any of the 3 Risk Thresholds specified by the RBI. For all 3 parameters there are 3 risk thresholds levels. In case of NPA, if a banks NPA is greater than 6% but less than 9% then it will

come under the risk threshold. In case of ROA if a banks ROA is negative for 2 consecutive years then it will come under risk threshold 1. And in case of CRAR a bank comes under risk threshold 1 if the CRAR is less than 10.25% but greater than 7.75%. Coming under risk threshold 3 is very bad for a bank.

After all the process of shortlisting the companies, the final list of companies numbered to 84. The shortlisting was based on an important factor which is credit rating. All the companies with a credit rating BBB and above are chosen. The rating above BBB for companies is a guarantee that the money will be paid back in time. The majority of prospective clients fall under the category of BBB TO BBB+ in the credit rating range. They amount to 31 companies. 70 companies of the prospective clients come under the revenue range of Rs.250cr. to Rs.6500cr. Below are 2 tables which shows the number of companies based on credit rating and revenue. The number of companies which fall under the range of BBB TO BBB+ is 31. This range has the highest number of companies. The majority share lies in BBB TO BBB+ and A- TO A+. The revenue range is classified in to 2 i.e. Rs250cr. To 6500cr. which is under the category of emerging large companies and Rs.6500cr. and above and they are large corporates. There are 68 prospective companies which fall under the category of Rs.250cr. to 6500cr.

Table 7

Count of companies based on credit rating

CREDIT RATING RANGE	No: of COMPANIES
A- TO A+	30
AA- TO AA+	9
BBB TO BBB+	31

Table 8

Count of companies based on Revenue

REVENUE RANGE	No: of COMPANIES
Rs.250cr. to Rs.6500cr. (ELC)	68
Rs.6500cr. & above (LC)	2

All the 84 shortlisted companies satisfy the banks standards. The Wholesale department of the bank looks upon those companies whose revenue/turnover is more than Rs.250crore. Companies

having revenue/turnover more than Rs.250crore comes under Emerging Large Companies (ELC). Another standard looked upon while shortlisting was PAT Positive. i.e. Profit After Tax. This PAT is a better assessment of what a business is really earning. Thus a company with Positive PAT ensures that the company is earning good revenues and it will be able to repay back the amount. Credit rating is also a factor taken into consideration while shortlisting the companies. A good credit rating shows the credit worthiness of a company i.e. how prompt they are in repaying the debt.

Suggestion

The period of PCA Framework is very stressful for Public sector banks, which can be utilized as an opportunity by the private sector banks. The PCA Banks will have limit / restrictions on their operations and also curbs on lending and deposits. During this period the private sector banks can work on to increase their operations/ activities. They can lend to those clients to whom these PCA Banks cannot lend. In this case, there are 70 prospective clients to whom the IDFC Bank can lend its money. One of the important factors considered while lending money is the credit rating of that particular institution. Considering the credit rating available for the prospective 70 clients, it would be a good option for IDFC Bank to lend to those companies whose credit rating lies in the range of AA- TO AA+. Also with enough collateral / security in hand the bank can lend to those companies with rating BBB & BBB+.

Also the PCA Framework was implemented on public sector banks to improve their operations and none of the private sector banks was present in this category. This is because the operations of private sector banks were much effective and improved than public sector banks. So to avoid falling under the guideline of PCA framework the private sector banks must maintain their operations in an effective and efficient manner. They must ensure that they do not enter the risk threshold parameters. It can be done by conducting timely audits, Stringent supervisory actions, proper recovery of credit, activation of recovery plans, conducting special audits, proper implementation of strategy, restructuring operations etc.

Conclusion

It is understood that currently the public sector banks are going through a tough phase, and it will continue for a period of time. So this gives the private sector banks to capture the market of public sector banks and also increase their lending capacity. These Banks which are under the PCA framework can lend only to those companies above a certain investment grade. Due to this

restriction these banks may lose out on a few customers. So the private sector can lend to those companies where these public sector cannot lend. This shows how much opportunity exists for all the private sector banks which can help in gaining their market share.

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Influence of Mother Tongue and its Impact on Spoken English of Malayali Speakers

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Abstract: A few centuries ago, English was spoken only by Elite groups and affluent people in India. Today, there are more non-native speakers than native speakers of English all over the world. English is used as an official language in over 60 countries of the world. Since it is an international language, different varieties of English are spoken around the world. The English spoken by the non-native speakers of English tends to be different from the English spoken by the native speakers. It happens because the non-native speakers of English are bi-lingual or multi-lingual. Therefore, dialectical variations become an integral part of the English language articulated by the non-native speakers of English. This paper attempts to focus on the influence of the Indian language, Malayalam on the Global language, English. Mother tongue influence leads to grammatical, syntactical and pronunciation errors in the target language. This study also focuses on how to tackle this universal problem and also hints some remedies which can be effectively utilized for learning the target language.

Influence of Mother Tongue and its Impact on Spoken English of Malayali Speakers

Language is our primary source of communication. It's the method through which we share our ideas with other people. There are thousands of languages in the world. Countries have their own national languages in addition to a variety of local languages spoken and understood by their people in different regions.

This paper attempts to prove the influence of Malayalam over the international language, English. The influence is on both the languages as one uses the other whenever there is a need. The speakers of Indian languages are influenced by English and even illiterate common man uses English words in his daily conversation. In Indian context, the capability to converse in English has become an issue related to jobs and prestige.

Importance of English

The importance of English has been globally accepted. It is the only language which is being taught as second language and used as official language in almost 90 countries. English as a global language is spoken by 750 million people around the world. English was originally the language of England, but through the historical efforts of the British Empire, it has become the primary or the secondary language of many former British colonies such as United States, Canada, Australia and India. Currently, English is the primary language of not only countries actively touched by British imperialism, but also many business and cultural spheres dominated by those countries.

There are several factors that make the English language essential to communication in our current time. First of all, it is the most common foreign language. This means that when two people who come from different countries usually use English as a common language to communicate. This is also called Lingua Franca. This is why everyone needs to learn the language in order to interact at international level. Secondly, English is essential when it comes to finding jobs in government departments or multinational companies. Thirdly, English language plays an important role in the domains of education, management, commerce and political relations, judiciary, engineering and is therefore an entry to social mobility, higher education and better job opportunities.

English language empowers peoples from around the world. Internet also plays an important role in promoting English as the standard language. Through the pages of various social networks people connect with each other from anywhere in the world, mostly through English. This is because this language is accepted worldwide. In India, the superiority and prestige of English over other languages of the country remain unquestioned. "India is the third largest English using population of the world, after USA and UK" states Aarti Bansal.

Varieties of Indian English

India is a country with heterogeneous languages, cultures and traditions. This characteristic of the country leads to the emergence of a number of Indian English dialects which comprises of Malayalam-English, Tamil-English, Hindi-English, Kannada-English, Bengali-English and so on. These Indian English dialects remain completely different from the British English. This dialectical English spoken in India varies depending on the socio-cultural background of an individual.

English spoken by the people of Kerala

Malayalam, the official language of Kerala, is classified as a South Dravidian language. About 31.8 million people consider Malayalam as their mother tongue. Possessing an independent written script, it also has an enriched literature. Influence of Sanskrit is most prominent in Malayalam in almost all linguistic areas. Thousands of words have found their way into Malayalam from Sanskrit.

The English used by the people of Kerala is the main subject of this study and this variety has its own characteristics. Kerala has the highest literacy rate and this means that most people of Kerala have some basic knowledge of English, which they might have acquired from their school education. But highest literacy cannot assure right pronunciation or perfect accent. In other words, literacy cannot bring about changes in the style or mode of communication.

Indian speakers of English display an accent that is totally different from the US or British pronunciation. Malayalam speakers also display an influence of their mother tongue in the English they speak. This makes their English pronunciation indecipherable to the native speakers. The different expressions and words used in English by the Indian speakers are well understood by the people within the country but the same would sound quite strange to a foreigner. This paper presents an overview of the influence of Malayalam on English in Kerala.

Reasons for mispronunciation or incorrect use of English in Kerala

Malayalam is a phonetic language and because of this reason, the pronunciation of the language is dependent upon the spelling. Therefore the speakers of Malayalam pronounce all the sounds as represented in the Malayalam script. As such, the speakers of Malayalam are accustomed to pronounce a language on the basis of how it is depicted in the script. This habituation leads them to pronounce an unphonetic language like English in the same way as it is used in the phonetic language Malayalam. Strict adherence to the usage of a phonetic language like Malayalam unknowingly forces them to apply the same standard values for an unphonetic language like English. The method of utterance of the Malayalam script forces them to apply the same rule for English pronunciation. They speak English with direct translation of Malayalam sentence in their mind. This bilingualism is easily noticed in educated native speakers of Malayalam. Moreover, native speakers of Malayalam seem to use English words in their Malayalam conversation more frequently than most other groups of language speakers in India.

Pennington and Richards point out that 'Pronunciation is largely identified with the articulation of individual sounds and to a lesser extent, with the stress and intonation patterns of the target language" (1986). As Mackay points out, a pronunciation "… error may be due to a transfer from the native language; an analogy with something correctly learned in the foreign language; a wild guess, vagueness in remembering the right form; or general lack of accuracy and language skill" (1967). The problem mostly occurs when a direct translation is made from native language to English. Most of the errors made are due to the difference in sound systems and due to the misinterpretation of spelling symbols. The ability to pronounce the structures or words is as important as the knowledge of grammar and vocabulary. Even the simplest words misspoken, keeps one from communicating effectively.

The following are examples of few words in English which are mispronounced by native speakers of Malayalam.

1. Uncle is pronounced as 'Ungle' (/k/ is pronounced as /g/)
2. Aunty as '*Aanty'* (aandy as aanty)
3. Orange as *'Oorange'* (O as Oo)
4. Coffee as *'Kooffi'* (Co as Koo)
5. Hospital as '*Hoospittel*' (tal as ttel)
6. Ostrich as '*Oostrich*' (O as Oo)
7. Work as *'Warkku'* (k as kku)
8. Jump as '*Jumb'* (/ p/ as /b/)
9. Campus as '*Cambus*' (/p/ as /b/)
10. Simple as *'Simble'* (/p/ as /b/)
11. First as '*Phast'* ('f' as 'pha')
12. Breakfast as '*Breakphaast'* ('fa' as 'pha')
13. Wire as '*Whyaare'* (ire as aare)
14. Masala as '*Masaala*' (sala as saala)
15. Sure as '*Shuvar'* ('o'as 'var')
16. Lipstick as *'Lifftick'* (/p/ as /f/)
17. Railway Station as '*Railway tation'* ('s' is omitted)
18. Onion as '*Oonion'* ('Aah' as 'Oo')
19. Occur as '*Okker*' ('Akkur' as 'Okker')
20. Doctor as *'Dookter'* (O as Oo)
21. Daughter as *'Dotter*' (t as tt)
22. Rare as '*Rayer*' ('reih' as 'rayer')
23. Best as '*Bhest*' (/b/ as 'bh')
24. Auto as '*Ootto*' ('O' as 'Oo')
25. Office as '*Ofees*' ('ice' as 'ees')
26. Tortoise as '*Tortooise*' ('tise' as 'oise')
27. Car as '*Caarr*' ('r' is emphasized)
28. Flower as '*Flowerr*' ('r' is emphasized)

29. College as '*Colaige*' ('ege' as 'aige')
30. Motorbike as '*Mottoorbyke*' (/t/ as 'tt')
31. Tap as '*Taapp*' ('ap' as 'aapp')
32. Current as *'Currend*' (/t/ as /d/)
33. Music as '*Myoosic*' ('z' as 's')
34. Pleasure as '*Pleasurre*' ('sh' as 's')
35. Zero as '*Seero*' ('z' as 's')
36. Fan as '*Phaan*' ('f' as 'ph')
37. Sam as '*Saam*' ('z' as 's')

In the examples listed below, the silent letters are also emphasized.

1. Car as '*Caarr'* ('r' is emphasized)
2. Flower as '*Flowerr*' ('r' is emphasized)
3. Honour as '*Hoonour'* ('h' is emphasized)
4. Plumber as *'Plumbberr'* ('b' is emphasized)

The following are a few examples of sentences spoken by native speakers of Malayalam using bilingual medium even in their colloquial speech.

1. Malayalam: "*Vendathu cheyyoo*."
   Indian English: "Please do the needful."
   Standard English: "Please attend to this matter."
2. Malayalam: "*Ningalude Marupadi Udan Pratheekshikkunnu"*
   Indian English: "Your earliest response is requested."
   Standard English: "I look forward to hearing from you soon."
3. Malayalam: "*Ningalude bhagathu ninnu"*
   Indian English: "From your side"
   Standard English: "From you"
   Malayalam: "*Njan Riju. Njan thaamasikkunnathuDelhi yil aanu."*
   Indian English: "Myself Riju. I live in Delhi."
   Standard English: "My name is Riju. I live in Delhi."
4. Malayalam: "*Market avide aanu."*
   Indian English: "Market is there."
   Standard English: "There is a market."
5. Malayalam: *"Innu raavile*"
   Indian English: "Today morning"
   Standard English: "This morning"

Indians usually follow a literal translation (without change in the sentence structure) from native language to the target language (English). As English language is flexible, it is changed by the speaker for convenience. The culture of local language surely interfere the target language in many aspects such as pronunciation, vocabulary and grammar. Indianism refers to the way a sentence has been structured as if it was literally translated from an Indian language to English.

Indian speakers of English are bi-lingual or multi-lingual and use English as their second language. Their first language is local language or mother tongue. Although Hindi is the National language of India, use of Hindi is limited to certain places and so English occupies its place. People of Kerala also like to speak English as it is a comfortable language in speaking and in writing. In urban areas, it is very common to see that young men and women use English with their mother tongue. The problem is that they sometimes mix local language with English.

There are many typical Indian English expressions. Some of which have been discussed above. These Indian English expressions are commonly used by Indians who speak English as a second language. Non-Indians or native speakers of English who are not familiar with these words or expressions cannot understand the meanings intended by the users. It has been discovered that when languages come in contact, there is transfer of linguistic items from one language to another due to the borrowing of words" (Kachru 1989). English language has been described by Crystal as an 'insatiable borrower' (p 267).

Precision

Languages are primarily meant for communication, but one must also note that there is a way to use them to ensure adequate intelligibility or precision of the utterance generated in a conversation. While local variations of the language are often acceptable locally, it may not be the case in the outside world, because such variations make no sense to a non-Indian.

This does not mean that all utterances in English generated by Indians are correct in relation to the generally accepted Standard English around the world. Indians must realize that the so-called Indian English that they speak in India is much different from the Standard British English. The Indianisms in English result in accent errors, syntax errors and grammatical errors. The fact is that the so-called 'Indian English' is not considered correct or accepted even within India.

Remedies for the problems faced by the English speakers of Kerala

The problems faced by the native speakers of Malayalam are, of course, a common problem faced by all the people of the world. But when it comes to tackling the problem, one of the ways is to firstly comprehend and list down the differences between the two languages, the learner's language and the target language and focus on those aspects.

The real problem in using language mostly occurs when a direct translation is made from native language to English. So, effort should be made to understand the pronunciation, syntax and grammar of Standard English.

Nunan suggests that the best time for students to learn a language in order to become as native-like in their pronunciation as possible is before the onset of puberty. He describes this critical period as a 'biologically determined period of life when language can be acquired easily and beyond which language is increasingly difficult to acquire" (1999)

Practicing speaking with others is another way of learning English. The more you practice, the better and more confident you become in your vocabulary and pronunciation. Interaction with friends, reading out loud, listening to radio, watching films and BBC news are some other ways of learning English.

Conclusion

English language assumes a pivotal role in global communication. In the midst of the variety of languages around the world, the ranking of English language is the number one in the world. Indians are not native speakers of English and they can never be. But there is nothing wrong in striving for precision and trying to go as close as possible to the generally accepted norms of English. To reach the zenith of glory, proficiency in mother tongue alone will not help. For achieving this purpose, one should also respect English language as one respects one's mother tongue.

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Investigating the Dynamic Interlinkages between Exchange Rates and the NSE NIFTY Index

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Abstract: This study aims at examining the short-run and long-run dynamic linkages among exchange rates and stock market index in India through a structured cointegration and Granger causality tests. Daily exchange rates of USD, EUR, CNY, JPY, and GBP to INR along with the daily movement of NSE NIFTY for a period spanning 13 years from 6 September 2005 to 31 December 2018 were used for the analysis. The results reveal that there is no evidence for a stable long-run relationship between NSE NIFTY and the exchange rates under study. However, the VAR-based Granger causality test shows that USD, JPY, and CNY have short-run causal relationship with NSE NIFTY. The NSE NIFTY also seemed to have an influence on USD expressed in terms of Indian rupee. The impulse response analysis further supports the results of the Granger causality test and provides information on the time required for the NSE NIFTY index to recover from a shock caused by the fluctuation in exchange rates.

Keywords: NIFTY; currencies; Granger causality; impulse response

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1. Introduction

Fluctuation in exchange rates is one of the significant factors that affect stock prices, which subsequently influences a firm's market value. Despite the fact that this topic has been discussed worldwide, there is still a lack of unanimity in the literature regarding the relationship between exchange rates and stock market indices (Mroua and Trabelsi 2020). As financial theory describes, the interest rates and exchange rates significantly influence the value of a firm and the upward and downward movements of the exchange rate play a pivotal role in determining the stock prices. In both developed as well as developing countries, the stock market plays a crucial role as far as financial intermediation is concerned. It channels the funds in an economy from surplus units to deficit units through resource mobilization, which is critical in the process of expansion and growth of an economy. Hence, the stock market acts as a channel in mobilizing savings and helps in the efficient allocation of funds, thereby fostering economic growth (Olugbenga 2012; Alile 1984).

Various hypotheses support the causal relationship between exchange rates and stock prices, such as, goods market approach, which defines that the competitive nature of the firm is affected by the change in exchange rates. It signifies that the exchange rate fluctuations affect the earning value and cost of funds along with their stock prices because companies start to borrow in foreign currencies in order to fund their processes (Dornbusch and Fischer 1980). The export of goods becomes attractive when there is a depreciation in the local currency, and it leads to an increase in foreign demand. As a result, the revenue of

a firm appreciates along with the appreciation in the firm's value and stock prices. Similarly, when the local currency appreciates, it leads to a decrease in profits of a firm that exports goods as there is a decrease in its products' foreign demand. However, there is a change in the sensitivity of the value of the firm to the change in the exchange rate, and it depends on whether it is an importing firm or an exporting firm (Nath and Samanta 2003).

An alternative approach is provided by the portfolio balance models, which stressed the role of transactions in capital account in studying the relationship between stock prices and exchange rates. For example, capital inflows from foreign investors have been drawn by an attractive performance of a stock market, which increases the demand for domestic currency. On the other hand, the demand for the local currency depreciates when there is a fall in stock prices as the foreign investors start selling their stocks (Adebiyi et al. 2009). Moreover, with time, foreign investment can increase in local equities as a result of the profits of international broadening to foreign investors. Hence, the upward and downward movements of stock prices affect the money demand and exchange rates because the liquidity demand and wealth of investors could be a factor that affects the stock market performance (Mishra 2004).

Several theories have suggested a causal relationship between the exchange rates and stock prices. Nevertheless, evidence that provides mixed results is also widely available. For instance, out of 171 multinational firms of Japan, only 25 Percent have shown a significant disclosure of exchange rate over the stock market (He and Ng 1998). Another study showed the empirical results that there was only a negligible impact of weekly exchange rate movement on the value of industry indices in many countries (Griffin and Stulz 2001). Moreover, some theories failed to identify a significant relationship between the movement of dollar prices and stock returns of US firms, for instance, Jorion (1990); Bartov and Bodnar (1994), etc.

Considering the interrelationship between the stock market indices and exchange rates, it is imperative that more studies need to be conducted in this regard. However, there is still a dearth of comprehensive studies that investigate this dynamic interrelation in the Indian context. The main aim of this study is to examine the linkages between the exchange rates and NSE NIFTY index using the daily data of NSE NIFTY closing values and exchange rates spanning 13 years (2005–2018). The objective is to identify whether variations in exchange rates influence the NSE NIFTY closing values, which can be a significant cue for the investors while making investment decisions. The NIFTY 50 is an index that indicates the weighted average of fifty Indian companies that are listed on the National Stock Exchange of India (NSE), which is the largest stock market in the country. This study analyses the long-run relationship between the exchange rate of US Dollar (USD), Euro (EUR), Chinese Yuan (CNY), Japanese Yen (JPY), British Pound (GBP) to Indian Rupee (INR) with NSE NIFTY index using a Johansen cointegration test. The short-run relationship between the above-mentioned variables is examined using a VAR Granger Causality test and impulse response function.

2. Literature Review

In a study conducted by Ibrahim (2000), the interactions between stock prices and exchange rates in Malaysia were examined using a Cointegration and Granger causality test. The study found no long-run relationship between stock prices and exchange rates, but evidence for cointegration was observed when M2 money supply and reserves were included in the analysis. The study construed that the short-run exchange rates did impact the stock market price. Likewise, other studies also supported that there is no significant relationship between the exchange rate and stock market indices in the long-run (Franck and Young 1972; Bhattacharya and Mukherjee 2002).

Phylaktis and Ravazzolo (2005) analyzed the short-run and long-run effects between stock prices and exchange rates and the channels through which exogenous shocks impact the markets of some Pacific Basin countries for a period between 1980 and 1998. A structured cointegration and multivariate Granger causality test were used for the analysis and

the results showed a positive long-run and short-run causality between stock prices and exchange rates. Another study by Gulati and Kakhani (2012) to find a causal relationship between INR/Dollar exchange rates and stock market indices (SENSEX and NIFTY) for a period of 2004–2012 used Granger causality and correlation analysis. Their results showed that there is a weak positive correlation between stock price indices and exchange rates for the aforementioned period.

The nature of the causal relationship between exchange rates and stock market performances of Switzerland and Poland from 2001 to 2008 was examined using both linear and non-linear causality tests. The results showed that the performance of the stock market is a causal factor for changes in exchange rates (Portfolio approach) for Switzerland. For Poland, both portfolio and traditional approach where changes in exchange rates caused fluctuations in stock market prices had an impact on the exchange rates (Gurgul and Lach 2012).

A study conducted in Nigeria for the period between 2001 and 2011 shows no significant relationship between exchange rate and stock market prices. The result of the Granger causality test indicates the absence of causality between the All Share Index (ASI) and exchange rates, which show the independence of exchange rates and stock market index in Nigeria (Zubair 2013). Similarly, a study conducted by Lee and Zhao (2014) explained the short-run and long-run causal relationship between stock market prices and exchange rates in China for a period between 2002 and 2012 using cointegration tests, vector error correction (VEC) estimates, block exogeneity Wald tests, impulse responses, variance decomposition techniques, and structural break tests. The results showed a long-run causality from exchange rates to stock prices in Chinese stock markets and a short-run causality from Japanese yen and Korean won exchange rates to stock prices in Shanghai Stock Exchange strongly prevails, whereas in the Shenzhen Stock Exchange the causality is weak. The impact of the global financial crisis from 2007 to 2009 on the Chinese stock markets was found to be insignificant.

Chkili and Nguyen (2014) studied the upward and downward movement of exchange rates and stock market returns in a regime-switching environment for BRICS countries for 16 years (1997–2013) using Markov autoregressive model and VAR model. The results showed that the returns from the stock market were higher than exchange returns in all BRICS countries. Among BRICS countries, South Africa is less volatile, and Russia is more volatile and changes in exchange rate do not affect the stock market return of BRICS countries. Inversely, the impact from stock market returns to exchange rates is significant for all BRICS countries. Likewise, a study conducted for Karachi stock exchange (KSE 100 Index, Pakistan) using the Johansen cointegration test and Granger causality test showed that there was no long-run relationship between exchange rates and the stock market prices (Ihsan et al. 2015). Poornima and Ganeshwari (2016), in their study about stock exchange in India, found that there exists a unidirectional relationship between exchange rates and the NIFTY Index.

Another study about the Indian stock market and foreign exchange rates of USD, Euro, Yen, and Pound sterling against the Indian rupee (INR) was conducted for a period of five years, 2011–2015. The study used the Granger causality test to find the cause and effect relationship between the stock market index and the exchange rates. The study explains that the cause and effect between stock market indices (Sensex and NIFTY) shows an inverse relationship between returns from foreign exchange rates USD, GBP, EURO, and YEN and the relationship between currency returns to other currency returns against INR shows a positive relationship. This explains that the cause and effect relationship is unidirectional (Kumarasamy and Chellasamy 2017).

From the literature, it could be seen that most of the studies in the related area used cointegration and Granger causality to test the long-run and short-run relationship between exchange rates and stock market indices. This study using similar methods hypothesizes that:

Hypothesis 1. *There is a cointegrating relationship between the exchange rates and the NSE NIFTY index.*

Hypothesis 2. *USD Granger causes NSE NIFTY index.*

Hypothesis 3. *EUR Granger causes NSE NIFTY index.*

Hypothesis 4. *CNY Granger causes NSE NIFTY index.*

Hypothesis 5. *JPY Granger causes NSE NIFTY index.*

Hypothesis 6. *GBP Granger causes NSE NIFTY index.*

3. Methodology

3.1. Data Description

The data used for the study were collected from the Bloomberg Terminal and National Stock Exchange (NSE) website. Daily exchange rates of USD, EUR, CNY, JPY, and GBP to INR along with the daily movement of NSE NIFTY 50 for a period spanning 13 years from 6 September 2005 to 31 December 2018 comprising 3286 observations were used for the analysis.

3.2. Cointegration

Regression analysis using non-stationary time series often makes the results spurious. Taking the first difference may not make the variables suitable for regression in most cases as information regarding co-movement may be lost in the process and ultimately result in poor forecasting (Sims 1980). In order to solve this issue, Engle and Granger (1987) suggested testing for cointegration among non-stationary time series. If the variables are cointegrated of the same order, then an "error correction" is said to exist, which explains the short-run dynamics between the cointegrated variables. In such cases, the appropriate method is to estimate the Vector Error Correction Model (VECM), which is the same as the Vector Auto Regression (VAR) in the first difference with a vector of cointegrating residuals. If the variables are not cointegrated, then a VAR model can be fitted.

3.3. Granger Causality Test

A time series Y_t Granger causes another time series X_t, if the present values of X can be predicted using the past values of Y and other relevant information, which includes the past values of X as well (Granger 1969). An F statistic is commonly used to interpret the results of causality. In the case of using more than two variables, such as an additional variable Z, which also mutually causes X or Y, a multivariate framework could be used. The Granger causality test used in this study is carried out in a VAR framework, which provides a flexible environment to conduct the analysis. The methods followed in this study are based on the procedure given by Granger (1969) and Engle and Granger (1987). Nevertheless, the specific technique to be used mainly depended upon the presence of cointegration among the variables.

3.4. Impulse Response Function

An impulse response function in very simple terms could be explained as a technique used to examine the path of a variable of interest in a VAR model after encountering a shock. The transmission of a shock could be tracked with the help of an impulse response function which facilitates the proper assessment of the behavior of a variable (Alloza 2017). Two methods are commonly used to depict the dynamic behavior of a VAR model and to identify the sources of variability: Impulse Response Function (IRF) and Variance Decomposition. The variance decomposition method suffers from limitations that may affect the characteristics of impulses. The generalized impulse response functions propounded by Pesaran and Shin (1998) offer better results as compared to the former. This study uses the

generalized impulse response function to analyze the dynamic behavior of the variables.

4. Results and Discussion

4.1. Descriptive Statistics

The descriptive statistics, along with the normality test for all the variables under study, are given in Table 1.

Table 1. Descriptive Statistics and Normality Test.

Descriptive Statistics	NSE	USD	EUR	CNY	JPY	GBP
Mean	6256.61	54.2226	68.5863	8.12960	0.53318	85.0561
Std. Dev	2298.33	9.79310	8.73385	1.84054	0.09875	9.36010
Skewness	0.46153	0.15552	0.07112	−0.14761	−0.51928	0.23232
Kurtosis	2.28362	1.54340	2.09774	1.45031	2.26508	2.19437
Wilk-Shapiro	0.91757	0.93570	0.97576	0.93865	0.95046	0.95835
p-Value	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Note: SW test null—Normal Distribution.

The descriptive statistics results include the mean values showing the average daily exchange rate variations, standard deviation indicating the extent of volatility from the mean value, skewness and kurtosis for normality tests are given in the table above. The Shapiro–Wilk normality test was also used to test the normality of the time series distributions. As can be seen, the kurtosis values are higher than the specified threshold, which implies that the time series data do not follow normal distribution. This is further confirmed using a Shapiro–Wilk Test, which rejects the null hypothesis that the data follow a normal distribution.

4.2. Stationarity Test

In order to test for cointegration, it is important to check the order of integration. The results of both Augmented Dickey Fuller (ADF) test and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test show that the variables are not stationary at level but are stationary after first differencing. Table 2 shows the results of the stationarity test.

Table 2. Tests for Stationarity.

Variable	Levels		First Difference (Δln)		Inference
	Dickey Fuller	KPSS	Dickey Fuller	KPSS	
NSE	−2.6286	28.66 **	−14.14 **	0.063	I(1)
USD	−2.7225	30.35 **	−13.78 **	0.085	I(1)
EUR	−2.6925	23.73 **	−14.78 **	0.041	I(1)
CNY	−1.8834	30.81 **	−13.64 **	0.156	I(1)
JPY	−2.0957	20.89 **	−13.96 **	0.088	I(1)
GBP	−2.0798	13.56 **	−14.59 **	0.065	I(1)

Note: Significant at 0.05, ** Significant at 0.01.

Line plots for the exchange rates and NSE NIFTY index for the period under study are shown in Figure 1.

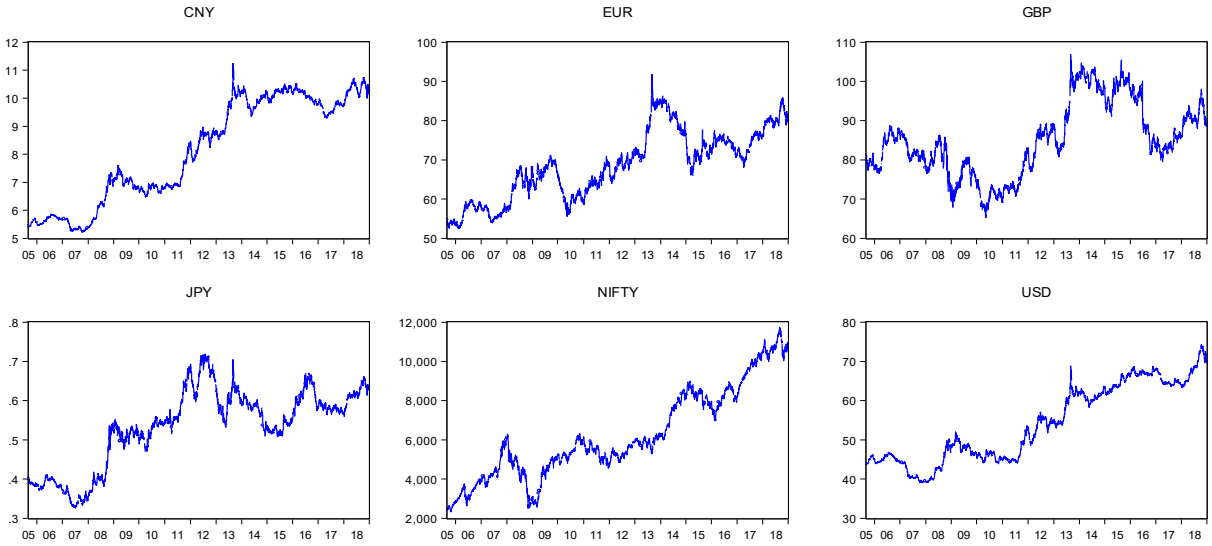

Figure 1. Line plots of the variables over the study period.

4.3. Test for Cointegration

Now that the variables follow the same level of integration, the existence of cointegration among them can be tested. If two variables x and y are I(1) processes and their linear combination et = β0 + β1 X + β2 Y, is stationary then the variables are said to be cointegrated of the order (1,1). The stochastic trends of these variables linked, such that they cannot drift apart in the long-run, pointing to an equilibrium relationship between them.

A Johansen multivariate cointegration test (Johansen 1988) was carried out to identify a cointegrating relationship between the variables. The test statistic, critical values, and rank of cointegration are shown in Table 3.

Table 3. Johansen Cointegration—Trace Statistic with linear trend.

Rank	Test Statistic	Critical Values		
		10 pct	5 pct	1 pct
r ≤ 5	1.17	6.50	8.18	11.65
r ≤ 4	5.50	15.66	17.95	23.52
r ≤ 3	13.27	28.71	31.52	37.22
r ≤ 2	22.52	45.23	48.28	55.43
r ≤ 1	35.34	66.49	70.60	78.87
r ≤ 0	64.41	85.18	90.39	104.20

The test results reject the hypothesis that the variables are cointegrated as the test statistic value for $r \leq 0$ cannot be rejected at 10 pct, 5 pct, and 1 pct. The test statistic values are not higher than the critical values for other cointegrating ranks as well. The results imply that there exists no long-run relationship between the exchange rates and the NIFTY index. Hypothesis 1 is rejected as no evidence could be found for a cointegrating relationship between the variables. The finding that USD to INR does not have a long-run relationship with NSE NIFTY index is corroborated by Bhuvaneshwari and Ramya (2017) using Johansen Cointegration test.

4.4. Causality Test

After finding no evidence for long-run relationship between the variables, the short-run causation effect was investigated using the Granger causality test. Stationarity of the variables is a prerequisite for the Granger causality test. Hence the log difference of the

variables was used to ensure that the variables follow constant statistical properties over the period of analysis. A unidirectional causality test using Granger causality test in VAR environment was carried out to check whether the changes in the exchange rate can predict the NIFTY index. The graphical representation of the variables in their first log difference is shown in Figure 2.

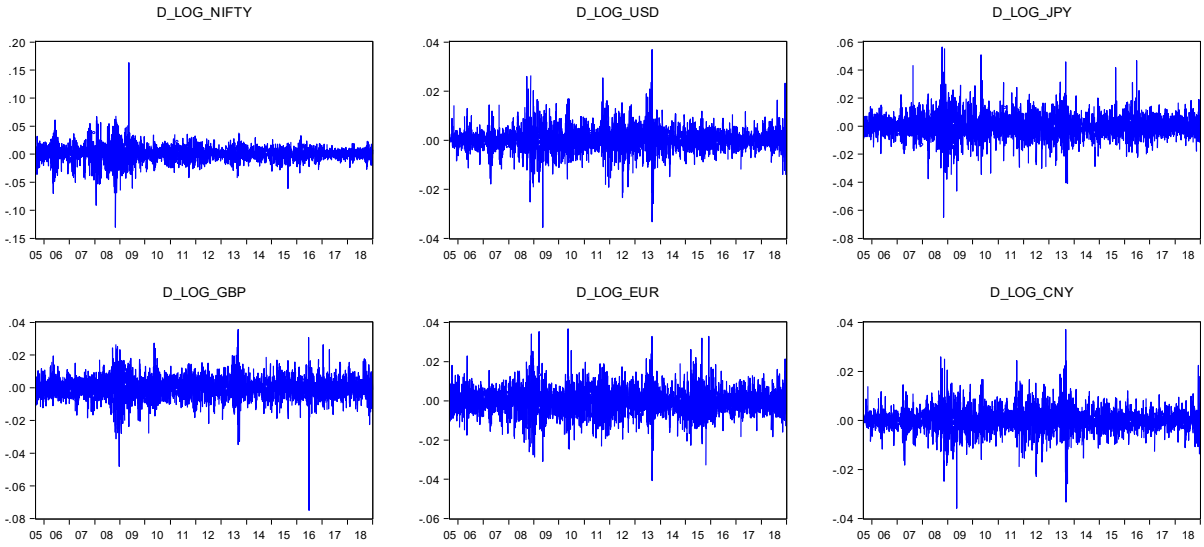

Figure 2. Variables after first log difference.

This study's scope is confined to the assessment of the impact of various exchange rates on the movement of NSE NIFTY index. Nevertheless, NSE NIFTY's influence on the exchange rates that are expressed in terms of Indian rupee was also estimated to identify causal effects. The lag order was set based on AIC criteria. The 13 years were split into three specific time durations (September 2005–September 2009, October 2009–October 2013 and November 2013–December 2018) to assess the short-term influence of movements in exchange rates on NSE NIFTY. Further to this, Granger causality test was also run for the overall period.

4.4.1. Split Up Periods

The split wise Granger causality test results show that the various currency pairs drive the nifty index in different periods. During the first split (2005–2009), the Euro and JPY were seen causing Nifty 50 movements. Nifty 50 was, in turn, Granger causing USD and CNY. In the Second split (2009–2013), Euro was seen as Granger causing Nifty and Nifty was found Granger causing Euro, JPY and GBP. These movements may be primarily contributed to the foreign trade figures. European Union, China and the USA were among the top 10 trading partners to India during those periods (Trade Statistics by Country | WITS n.d.).

The Final Split (2013–2018) further shows that USD, CNY and JPY are causing Nifty and Nifty causing USD and CNY. Along with the foreign trade figures (with China, USA, and Japan) the FII flows are also the reason for the bi-directional relationship between USD and Nifty. Overall, the research found that the short-term relationships between the various currency pairs and nifty index is primarily driven by the foreign trade figures and FII flows. Tables 4–6 show the granger causality test results for the split periods; September 2005 to September 2009, October 2009 to October 2013 and November 2013 to December 2018 respectively.

Table 4. Granger causality in VAR Framework for the period September 2005–September 2009.

Independent Variables	Dependent Variable	F Statistic	*p*-Value	Independent Variable	Dependent Variable	F Statistic	*p*-Value
ΔlnUSD		1.766	0.184		ΔlnUSD	8.457	0.003
ΔlnEUR		3.060	0.015		ΔlnEUR	0.276	0.893
ΔlnCNY	ΔlnNSE	1.546	0.214	ΔlnNSE	ΔlnCNY	7.248	0.007
ΔlnJPY		12.50	0.000		ΔlnJPY	0.223	0.636
ΔlnGBP		0.008	0.926		ΔlnGBP	0.180	0.670

Note: Granger Causality Null—No Granger Causality.

Table 5. Granger causality in VAR Framework for the period October 2009–October 2013.

Independent Variables	Dependent Variable	F Statistic	*p*-Value	Independent Variable	Dependent Variable	F Statistic	*p*-Value
ΔlnUSD		1.225	0.293		ΔlnUSD	1.667	0.189
ΔlnEUR		5.846	0.015		ΔlnEUR	8.446	0.003
ΔlnCNY	ΔlnNSE	1.268	0.210	ΔlnNSE	ΔlnCNY	1.657	0.190
ΔlnJPY		0.281	0.754		ΔlnJPY	4.433	0.011
ΔlnGBP		0.594	0.552		ΔlnGBP	7.145	0.000

Note: Granger Causality Null—No Granger Causality.

Table 6. Granger causality in VAR Framework for the period November 2013–December 2018.

Independent Variables	Dependent Variable	F Statistic	*p*-Value	Independent Variable	Dependent Variable	F Statistic	*p*-Value
ΔlnUSD		4.636	0.000		ΔlnUSD	3.706	0.002
ΔlnEUR		3.336	0.067		ΔlnEUR	0.000	0.982
ΔlnCNY	ΔlnNSE	2.507	0.007	ΔlnNSE	ΔlnCNY	2.225	0.018
ΔlnJPY		5.464	0.019		ΔlnJPY	0.277	0.598
ΔlnGBP		0.932	0.334		ΔlnGBP	0.2565	0.612

Note: Granger Causality Null—No Granger Causality.

4.4.2. Overall Period (2005–2018)

The results of the Granger causality test (from 2005 to 2018) show that the changes in the USD, CNY, and JPY Granger cause NSE NIFTY implying that fluctuations in the exchange rate of USD, CNY, or JPY will cause volatility in NSE in the short-run. However, other exchange rates did not seem to have a causal relationship with the NSE NIFTY index. The USD/INR exchange rates and nifty movements are interconnected, which re-establishes the fact that Indian markets are still tracking the US economy and substantial dollar-denominated funding happens in the Nifty index. The dollar-denominated transactions further point out that the fund flows which gained momentum after quantitative easing (after 2009) have not stopped yet. This may mean that the Indian stock markets are still giving better spread in comparison to US domestic investments. This is evident from the latest charts of the United States and Indian 10 year Government securities. As of the 24 August 2020, Indian 10 year was trading at 6.22 levels and the US 10 year was at 0.64 levels (Trading Economics n.d.).

Another reason for the causal relationship between the above-mentioned exchange rates and the NIFTY index is the trade relations of India with these countries. The US became India's largest trade partner with a trading volume of $87.95 billion in 2018–2019 by surpassing China with which the bilateral trade was worth $87.07 billion (The Economic Times 2019). The causality between the trade-weighted dollar index (ΔlnTrade Weighted Dollar Index) and the NSE NIFTY (ΔlnNSE) was further examined to confirm the impact of an improved trade relationship between India and the US on NSE NIFTY. The VAR Granger test results with an F value of 4.056 is significant at 0.012 percent significance

level and further strengthens the causal relationship. However, the reverse relationship between the variables did not seem to be significant, with an F value of 2.3056 and p-value of 0.129. Table 7 shows the results of the Granger causality test for the period January 2005 to December 2018.

Table 7. Granger causality in VAR Framework for the period January 2005–December 2018.

Independent Variables	Dependent Variable	F Statistic	*p*-Value	Independent Variable	Dependent Variable	F Statistic	*p*-Value
ΔlnUSD	ΔlnNSE	6.990	0.000	ΔlnNSE	ΔlnUSD	3.152	0.007
ΔlnEUR		1.0244	0.311		ΔlnEUR	2.044	0.152
ΔlnCNY		6.242	0.000		ΔlnCNY	1.7041	0.139
ΔlnJPY		10.847	1.982×10^{-5}		ΔlnJPY	1.3125	0.269
ΔlnGBP		0.0057	0.939		ΔlnGBP	0.6725	0.644

Note: Granger Causality Null—No Granger Causality.

For the same period, the trade with Japan totaled $17.63 billion (Embassy of India Japan 2020). The recent currency swap worth $75 billion between India and Japan might have had a short-term impact on the capital markets in the country, especially on the National Stock Exchange (Oberoi 2018). Moreover, Japanese Yen being a safe haven, will appreciate at times of financial turbulence, hence, it can be said that Yen impacted the movements of the Nifty 50 index, i.e., when Yen appreciates it is possible that there is a pessimism in the global markets (Hampson n.d.) and this would eventually pass on to the Indian index. The analysis also points out that the INR market has started tracking the Chinese Yuan. In fact, Indian Rupee is more correlated with the Chinese Yuan than the USD. The reason being the rapidly expanding money supply pressurizing the Chinese regulators to devalue their currency, which makes the exports competitive for China. This would adversely impact the Indian trade, which gets reflected in the Nifty 50 index (Patel n.d.). Based on the results, Hypotheses 2, 4, and 5 are accepted.

It is also interesting to observe that the causal relationship between EUR, GBP, and NSE NIFTY index is not significant because the FII equity inflows in terms of GBP and Euro are not as massive as USD and JPY. The fund flows in terms of these currency denominations suggest that they are insufficient to cause any significant change in the Nifty 50 index (NSDL n.d.).

The Bidirectional causality results further revealed that the Nifty 50 index does influence the USD/INR exchange rates. There are multiple reasons for this. The prominent one being the Foreign Institutional Investors (FII). When the FIIs pour in money to the Indian stock markets, the money, in terms of USD, needs to be converted to INR, creating a demand for INR and its appreciation against USD (Khatri n.d.). From the financial year 2011–2012, the United States of America has the most FII investments in equity flows to the Indian markets. The USA's FPI inflow towards the Indian Equity markets for 2017–2018 was Rs.9,65,768 crores (NSDL n.d.). These flows substantiate that a part of USD/INR exchange rate fluctuations is due to dollar-denominated equity flows into the Indian Market. A stronger Nifty 50 would mean that the rupee stays strong against dollars because of the dollar infusion into the Indian equity market.

4.5. Impulse Response Functions

Impulse Response functions are used to figure out to what extent a shock in one of the exchange rates under study would affect the NSE NIFTY index over a period of 12 months for the entire study period. The results are given in Figure 3.

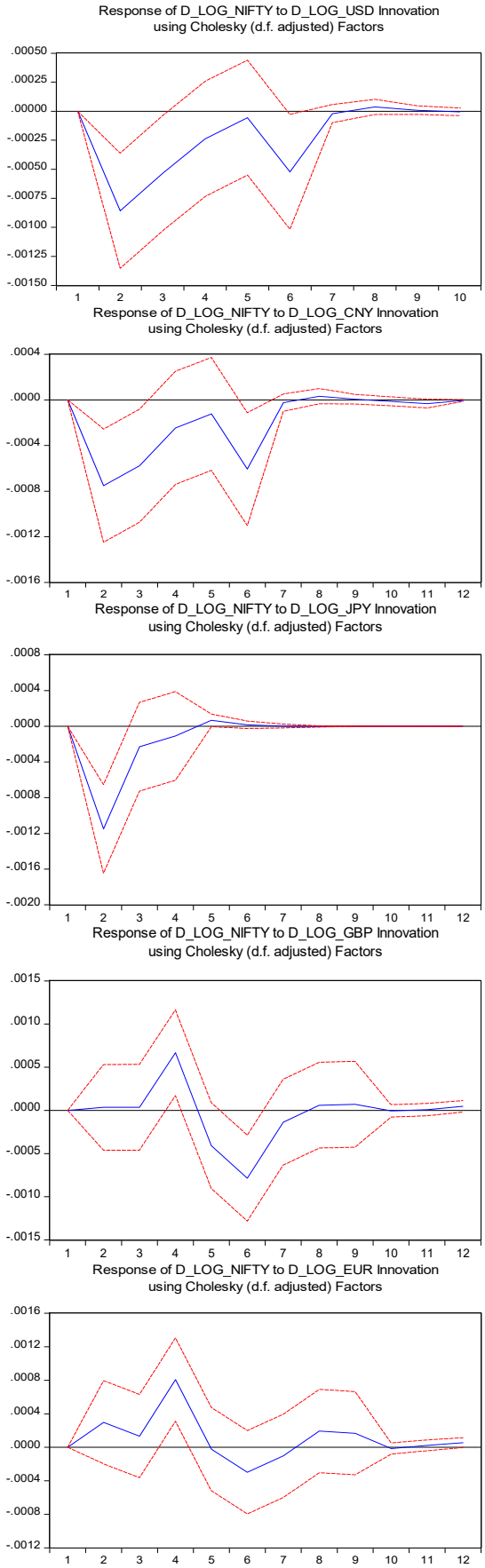

Figure 3. Impulse Response Analysis Results.

The response of D_LOG_NIFTY to a shock caused by D_LOG_USD shows that NIFTY falls in the first and second period and then rises and converge to zero close to the 10th period. In the case of Chinese Yuan, a shock caused by D_LOG_CNY will result in the drop of D_LOG_NIFTY in the first two periods and then rises and converge to zero close to 10th period. D_LOG_NIFTY responds to the shock caused by D_LOG_JPY in a similar way as it responded to D_LOG_USD and D_LOG_CNY, where NIFTY drops starkly in the first two periods and then rises. Unlike the other two currencies, NIFTY totally converges to zero after the seventh period. The shock caused by D_LOG_GBP and D_LOG_EUR on D_LOG_NIFTY shows a different trend from the first three cases. D_LOG_NIFTY rises from second period and then falls starkly until sixth period. The shock caused by D_LOG_EUR also follows a similar pattern. However, both D_LOG_GBP and D_LOG_EUR do not converge to zero like the other three currencies.

5. Conclusions

This study aimed at analyzing the short-run and long-run linkages between exchange rates and NSE NIFTY index through a Johansen cointegration and a Granger causality test. The results of the cointegration analysis show that no long-run relationship exists between exchange rates and NIFTY index. This result implies that the variations in the exchange rates under this study may not have a significant influence on NIFTY index in the long-run, hence, the investors who are into long-term trading do not necessarily have to be cautious about the short-term fluctuations in the exchange rates. The Granger causality test results indicate that the USD, CNY, JPY exchange rates have a positive and significant relationship with NIFTY index. The findings are further supported by the Impulse Response Function analysis that gives the time required for convergence of NIFTY index following an initial shock. This finding indicates that the stakeholders need to keenly follow the short-run fluctuations in the above-mentioned exchange rates if their intention is to engage in short-term trading. One of the limitations of this study is that it uses conventional methods of cointegration and Granger causality to assess the relationship between the variables. Future studies in this area should consider the volatility spillover effects using more appropriate methods.

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A STUDY ON THE INFLUENCE OF WEBSITE QUALITY OF MOBILE FOOD ORDERING APPS (MFOA) ON CUSTOMER SATISFACTION

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ABSTRACT

Statistics reveal that the food tech industry though at a nascent stage is poised to grow in leaps & bounds. Numerous factors contribute to this phenomenon of which, rising internet penetration and accessibility, favorable consumer disposition, expanding network of restaurants on food tech platforms, increasing social acceptance etc. are the primary drivers. The purpose of this study is to focus on how the website quality influences customer satisfaction while using food apps. For this, SEM was employed to test the model and the hypothesis. The findings from Pearson Correlation indicate that there is a positive significant influence of website quality on customer satisfaction. Further this study attempts to assess the level of customer satisfaction in food apps while ordering food using MFOA. Besides, a sneak peek on the level of customer satisfaction discloses that the satisfaction level among the users is good.

Keywords: Mobile food ordering apps (MFOA), Website Quality, Customer Satisfaction.

1. INTRODUCTION

A slew of online food delivery players have through partnerships been building scale by zeroing in strategies that can offer a veritable buffet to its customers, thus leaving the organized food business a robust growth potential and a promising future. IBEF report states that the online food delivery industry is growing at 150 percent year on year. The article by Sarvant Singh in Forbes revealed that the online food delivery is estimated to reach $200 Billion by 2025 stand testament to this growth strategy. As per the BCG report there is a burgeoning increase of online buyers specifically due to multiple factors like growing internet penetration, strong value proposition offered by online merchants, proliferating payment platforms, and rising e- commerce adoption.

The internet based electronic commerce environment enables consumers' to purchase products & services through online mode. With the advent of technology, people are more prone to use apps for availing products & services. From paying bills to buying groceries, people started depending more on mobile apps. The growth in discretionary income coupled with shortage of time due to new lifestyle paved the way for the quick acceptance of mobile food ordering apps. Thus MFOAs gained popularity especially among youngsters, who could leverage technology to their advantage of doing business via the internet. Moreover MFOA provides the luxury of dining at the comfort of one's home, the cuisine which one selects based on one's preference. In contrast to brick and mortar stores the online platform has additional attributes like the navigation which solely depends on the user interface. A well designed user interface system will help the consumers in searching out their preferred choice, spending less time and more convenient. This study gives insight to the food delivery players to identify the level of customer satisfaction while using the food apps and how to make each interaction enjoyable.

2. REVIEW OF LITERATURE

Review of literature reveals that there are hardly a few studies focusing on the influence of website quality of food delivery apps and its effects on customer satisfaction.

Mobile Food Ordering Apps

As indicated by Sethu and Saini (2016), The online food requesting applications were broken down by the scientist based on specific qualities. A Large part of the buyers knew about buying on the web and found that it is exceptionally advantageous to utilize the web.

Boyer and Hult (2005) said that the Behavioral Scoring Model which says that the organizations examines the criticism overviews of the clients, considers their buying conduct and designs and anticipates the future buying practices of the clients. This exploration model involves barely any components which causes the organization to accomplish great outcomes.

As indicated by G. See-Kwong (2017), The food conveyance framework in India has been developing at a bigger pace because of innovation. From making orders accessible as need to be requesting on the web and fulfilling all the necessities of the clients and making changes as per the changing needs of the clients. Presently everything can be conveyed to the clients at their doorstep.

As per Adithya R., Singh, Pathan and Kanade (2017), A food menu is set in the online food requesting framework so the clients can put in their requests effectively and with this they can likewise follow their requests. Additionally, different offices are likewise given by these applications to making its entrance helpful for the clients.

Donkoh and Quainoo (2012) expressed that the Customers' discernments about food and administrations are significant for the food and administration industry since it encourages them to recognize the necessities and inclinations of the clients and fulfill them. In this investigation the impressions of the client were decided on different components.

Darn and Tran (2018) said that the Internet has assumed a significant job in expanding the familiarity with the online food conveyance applications. Through the web, individuals can look about nourishments and cafés, think about their costs and their administrations and have simple access to them. Web has made every one of these things helpful for the clients.

Kanteti (2018) expressed that Startups have become the innovators in India and are administering the economy since recent years. These organizations are begun by technically knowledgeable youthful people. These youthful people having new minds and mew and imaginative thoughts begins various types of organizations with the assistance of innovation.

As indicated by Hossain (2000), With the adjustments in mentality of the shoppers, innovation and socioeconomics in our general public, there should be changes in food conveyance frameworks so as to work well for the clients. Yang Fan (2014) expressed that Web App and Android Apps have been created lately after the improvement of data innovation. As contrasted with the work area App, the upsides of web App are that there is no need of refreshing or establishment and programs can be effortlessly visited. The upsides of android App are the advancement of an amazing system, comfort, wide commercial center for application dispersion.

Leong Wai Hong (2016) expressed that People have dealt with their errand effectively and productively due to mechanical progressions. The board framework helps in diminishing human labor tasks, helps in decreasing the time, and further aides in creating reports for the board reason by completely using the framework.

Customer Loyalty

Chaudhuri and Holbrook (2001) and Hsin and Hsin (2011) referenced that there are two sorts of unwaveringness: attitudinal dependability and social devotion. Attitudinal dependability shows long term mental duty of a customer to a store or organization (Caruana 2002; Shankar et al. 2003; Hsin and Hsin 2011). Attitudinal reliability can be seen from the mental contribution, partiality, and a feeling of altruism on specific items (Chang et al. 2009).

The Antecedents of Online Customer Satisfaction

Liu et al. (2008) define the predecessors of buyer satisfaction dependent on the phases of the web based buying process: data search and assessment of options, buying, and post-buy stage. At the data search and assessment of options stage there are data quality, web composition and product properties. While at the buying stage there are exchange capacity, responsiveness, security/protection, and instalment. In the post purchase stage, Liu et al. (2008) included conveyance and client assistance. Those precursors may affect consumer loyalty online stores.

Customer Satisfaction

Satisfaction is a passionate or psychological reaction to a center (desires, item, utilization experience, and so forth.), at once (after utilization, after the vote, the aggregation of experience, and so on.). Satisfaction is a post-buy wonder. Satisfaction was estimated uniquely during the assessment procedure (Giese and Cote 2002).Westbrook and Reilly (1983), cited in Giese and Cote (2002) uncovered that satisfaction is an enthusiastic reaction to the involvement in the item (or administration) that have been bought, retail outlets, or even examples of conduct, for example, shopping and purchasing conduct. Enthusiastic reaction was gone before by an intellectual assessment procedure, observation (or conviction) of an article, activity, or condition, contrasted with the estimation of the individual (or the necessities and needs).

Website quality

As indicated by Wang et al. (2010), the plan of the site is related with buyer view of the association and request at the site. The stylish measurement, specifically, is identified with buyer impression of the presence of the site. Online buyers with various inspirations will react to the web architecture in various manners just as purchaser inspiration influences the data preparing examples and feelings. Manes (1997) in Liu et al. (2008) and Szymanski and Hise (2000) states that the great site has a decent association, so customers will be anything but difficult to locate the ideal data about the item. Great web architecture is a slick screen appearance, make data way, and snappy data stacking. Those components will make a great looking buyer and may impact consumer loyalty. Liu et al. (2008) referenced the product characteristics at the phase of data search and assessment of options. As per Szymanski and Hise (2000), stock qualities are characterized as elements identified with the proposal for online deal which is excluded from the web composition and shopping accommodation. In particular, the properties are characterized as product assortment and quality items that mirror a specific cost. The lower expenses of data chasing and the more item varieties, it will be more appealing to shoppers, since customers may get more data and pick an assortment of items in a single spot. Strauss and Frost

(2009) states that web based shopping in one online store will spare the time. Wide assortment of items, the impression of unrivaled items, and the view of low costs will positively affect consumer loyalty.

3. RESEARCH METHODOLOGY

Descriptive research design is used in this study and a pilot study was conducted to have reliability check on the questionnaire used. The target population included the customers who have purchased food by ordering through a mobile food ordering app in Ernakulam district. The study was conducted during the pandemic period, and had limitations for collecting data due to lock down regulations. Hence Snowball sampling was used and the questionnaire was administered by Google sheets. The survey instrument was developed by the researcher after an extensive review of literature based on which sufficient constructs were framed to elicit information regarding the two variables used. A five point Likert scale was administered to collect information, of which 5 indicating strong agreement and 1 indicating strong disagreement and 3 indicating neutrality.

4. DATA ANALYSIS

The result of frequency analysis used to examine the quality of the respondents is shown in table 1. The ratio of male and female is 37 % and 63 % respectively. There is variation in the age group as the majority (66%) of the respondents belong to the below 25 years age group and the majority are postgraduate students. It can also be understood that the major portion of the respondents reside in urban and semi urban areas where as a minor percentage represents that of rural areas.

Table 1: Characteristics of participants in the study

Demographics	Group	Frequency	Percentage
Gender	Male	74	37.0
	Female	126	63.0
Age	below 25	132	66.0
	25 and above	68	34.0
Education	High School	2	1.0
	Graduate	66	33.0
	Post Graduate	126	63.0
	Ph.D	6	3.0
Occupation	Wage Earners	3	1.5
	IT Industry/Financial Industry	2	1.0
	Self Employed	7	3.5
	Govt. employed	6	3.0
	Student	182	91.0
Annual Household Income	Below 1,50,000	91	45.5
	1,50,001- 4,00,000	45	22.5
	4,00,001- 6,00,000	32	16.0
	Above 6,00,000	32	16.0
Area	Urban	87	43.5
	Semi Urban	76	38.0
	Rural	37	18.5
	Total	200	100.0

Source: Computed from data

4.1 Influence of demographic characteristics on Customer Satisfaction of Food App

The study has been aimed to get deeper insight on the influence of demographic characteristics on customer satisfaction.

Ho: Demographic characteristics do not have an influence on customer satisfaction.

One way ANOVA with multiple comparison tests, is carried out to analyse whether the variables considered significantly varied with the demographics of the respondents and the results are exhibited in table 2.

The test was performed to ascertain whether a significant difference in customer satisfaction existed between the respondents based on the demographic characteristics like gender, age, education, occupation, annual household income and area.

Table 2: Means, Standard Deviation and F value for Customer satisfaction

Demographic	Group	N	Mean	Std. Deviation	Z/F	P value
Gender	Male	74	34.34	10.07	-0.470	0.639
	Female	126	34.98	8.98		
Age	below 25	132	35.38	8.94	1.334	0.184
	25 and above	68	33.51	10.14		
Education	High School	2	35.00	0.00	0.124	0.946
	Graduate	66	35.32	8.94		
	Post Graduate	126	34.46	9.85		
	Ph.D	6	34.33	5.39		
Occupation	Wage Earners	3	44.00	0.00	2.157	0.075
	IT Industry/Financial Industry	2	46.00	0.00		
	Self Employed	7	29.00	13.10		
	Govt. employed	6	34.67	5.82		
	Student	182	34.69	9.27		
Annual Household Income	Below 1,50,000	91	35.34	9.40	2.343	0.074
	1,50,001- 4,00,000	45	35.53	8.95		
	4,00,001- 6,00,000	32	30.78	9.91		
	Above 6,00,000	32	35.91	8.75		
Area	Urban	87	34.40	11.14	5.809	0.004
	Semi Urban	76	37.04	6.39		
	Rural	37	30.84	8.81		

Source:

From the ANOVA, It is observed that all the demographic factors except the demographic variable, area are found to be insignificant ($p>0.05$). Even if there are variations in mean scores between the different categories in each of the demographic factors, the test result reveals there is no difference between them with respect to customer satisfaction. However, it can be concluded that customer satisfaction varies within the area as the p value is 0.004. Hence the Multiple comparison test, (post- hoc) was done to ascertain which of the group (area) means were significantly different from others at significance level, $p<0.05$. The results of the post hoc comparison test are detailed in table 3.

The result indicated that the rural area significantly differed from urban & semi urban areas. However, no such difference existed between semi urban & urban areas.

Table 3: Multiple Comparison Test

(I) Area		Mean Difference (I-J)	Std. Error	Sig.
Urban	Semi Urban	-2.63717	1.43845	.068
	Rural	3.56446*	1.79811	.049
Semi Urban	Urban	2.63717	1.43845	.068
	Rural	6.20164*	1.83653	.001
Rural	Urban	-3.56446*	1.79811	.049
	Semi Urban	-6.20164*	1.83653	.001

4.2 To study the relationship between website quality and customer satisfaction

The main objective of this study is to find out the relationship between Website Quality and Customer Satisfaction.

4.2.1 To study the relevant parameters that influence the website quality of food apps while using MFOA

To study this objective the measurement model is first obtained using CFA, which is indicated in Table 4.

The hypotheses that are to be proved are:

Ho: Construct WQ1 to WQ 13 have no impact on WQ.

H1: Construct WQ 1 to WQ 13 have significant impact on WQ.

Table 4: Model fit Indices for CFA- WQ's

	χ^2	DF	P	Normed χ2	GFI	AGFI	NFI	TLI	CFI	RMR	RMSEA
Website quality	70.465	40	.002	1.762	.948	.881	.977	.980	.990	.031	.062

All the attributes were loaded significantly on the latent constructs. The value of the fit indices indicates a reasonable fit of the measurement model with data.

The validity of the hypotheses was assessed by examining the regression coefficients of extracted constructs. The results of the path coefficients' analysis confirmed that the entire factors have an influence on Website Quality as the value (standard regression weights) was found greater than 0.4. All the attributes loaded significantly on the latent constructs. The value of the fit indices indicates a reasonable fit of the measurement model with the data. In short the measurement model confirms the factor structure of the constructs.

The result of the regression coefficients is presented in Table 5.

Table 5: Standardized Regression Weights (Factor Loading)

Path	Estimate	Critical Ratio (CR)	P	Variance explained	Rank
WQ1 → Website quality	0.837	16.998	<0.001	70.0	6
WQ2 → Website quality	0.851	17.682	<0.001	72.4	4
WQ3 → Website quality	0.831	16.722	<0.001	69.1	9
WQ4 → Website quality	0.738	13.279	<0.001	54.5	13
WQ5 → Website quality	0.835	16.905	<0.001	69.8	7
WQ6 → Website quality	0.774	14.460	<0.001	59.9	11
WQ7 → Website quality	0.816	16.067	<0.001	66.7	10
WQ8 → Website quality	0.834	16.859	<0.001	69.5	8
WQ9 → Website quality	0.844	17.333	<0.001	71.2	5
WQ10 → Website quality	0.928	23.072	<0.001	86.1	2
WQ11 → Website quality	0.933	23.595	<0.001	87.1	1
WQ12 → Website quality	0.761	14.016	<0.001	58.0	12
WQ13 → Website quality	0.911	21.522	<0.001	83.0	3

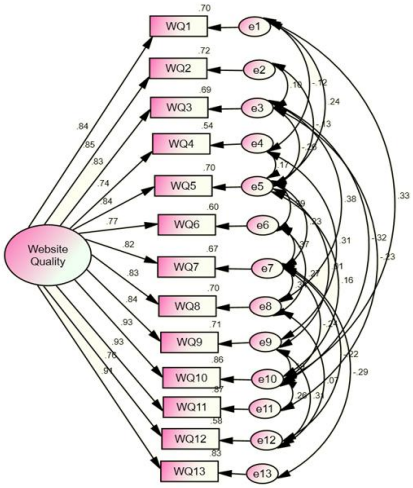

Figure 1: Measurement Model of Website Quality

From the above table it is observed that all constructs have the regression coefficient value greater than 0.4. Thus it can be inferred that all the constructs considered have significant influence on website quality. Moreover it is understood that usage of the app is the most influencing factor followed by credibility of the app and delivery assurance. Feeling of privacy along with the customer's confidence that the app will provide error free delivery stands as the next important factor when considering the quality of the website. The factors associated with the design of the app like its user friendliness, features, and the hyperlinks used, payment security, information, content, variety offerings and finally error free transactions are found to be the order of importance affecting the website quality.

4.2.2 To study the relevant parameters that influence the customer satisfaction of food apps while using MFOA

To study the above objective the constructs that influenced the customer satisfaction were also assessed by using SEM. The measurement model was obtained for the variable customer satisfaction as exhibited in table 6. The hypotheses that are to be proved are:

Ho: Construct CS1 to CS 10 has no significant impact on Customer satisfaction.

H1: Construct CS1 to CS 10 has a significant impact on Customer satisfaction.

Table 6: Model fit Indices for CFA-Customer satisfaction

	χ^2	DF	P	Normed χ2	GFI	AGFI	NFI	TLI	CFI	RMR	RMSEA
Consumer satisfaction	33.788	27	.172	1.251	.970	.938	.981	.994	.996	.032	.036

All the attributes loaded significantly on the latent constructs. The value of the fit indices indicates a reasonable fit of the measurement model with data. The validity of the hypotheses was assessed by examining the regression coefficients of extracted constructs. In this case the entire constructs have value greater than 0.4 and hence it can be concluded that all factors considered have significant influence on the variable customer satisfaction.

Table 7: The regression Coefficients

Path	Estimate	Critical Ratio (CR)	P	Variance explained	Rank
CS1 → Consumer satisfaction	0.895	21.842	<0.001	80.1	1
CS2 → Consumer satisfaction	0.883	20.977	<0.001	78.0	3
CS3 → Consumer satisfaction	0.874	20.381	<0.001	76.4	4
CS4 → Consumer satisfaction	0.824	17.654	<0.001	67.8	5
CS5 → Consumer satisfaction	0.791	16.219	<0.001	62.6	6
CS6 → Consumer satisfaction	0.759	15.007	<0.001	57.6	7
CS7 → Consumer satisfaction	0.895	21.842	<0.001	80.1	2
CS8 → Consumer satisfaction	0.713	13.488	<0.001	50.8	9
CS9 → Consumer satisfaction	0.751	14.726	<0.001	56.4	8
CS10 → Consumer satisfaction	0.685	12.661	<0.001	47.0	10

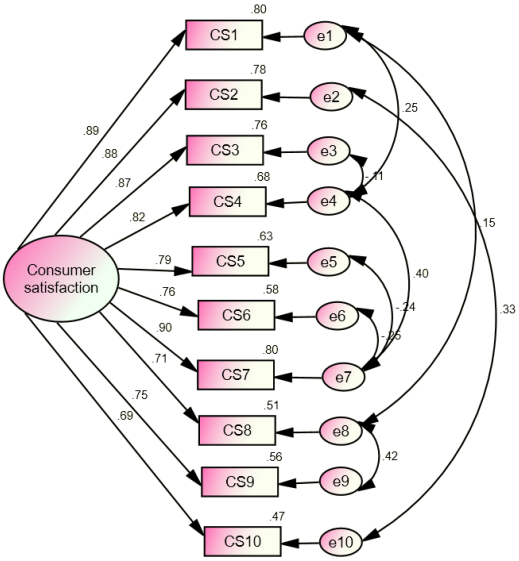

Figure 2: Measurement model of Customer satisfaction

From the regression coefficients value obtained in Table 7, it can be inferred that the variety options, the propensity to continue to use the food app, the good experiences, ease in transactions, service quality, speed of delivery, discounts offered are in the order of importance which affected the customer satisfaction of food app. Furthermore, the delight in using the food app, timely redressal of complaints (addressing the complaints) & the overall service satisfaction also found relevant in the influence of customer satisfaction of the food apps.

4.2.3 In order to assess the relationship between website quality and customer satisfaction the following hypothesis was generated

Ho: there is no relationship between website quality and customer satisfaction

The Pearson Correlation is deemed to be adequate to analyze the relationship between the two variables which were interval-scaled and ratio-scaled. Furthermore, correlation coefficients reveal magnitude and direction of relationships which are suitable for hypothesis testing and the results are exhibited in Table 8.

Table 8: The Pearson Correlation between Website Quality and Customer satisfaction

Variables	Correlation	Lower bound	Upper bound	Z	p
Website quality and consumer satisfaction	0.791	0.773	0.809	18.192	<0.001

In the above table the correlation between website Quality and Customer satisfaction is .791, which is above .50 and the p value is less than .05 hence found to be significant. Thus we reject the Null hypothesis. i.e. the correlation value denotes a significant positive relationship between these two variables. As there exists a positive relationship, the next step is to evaluate the mathematical relationship between these variables using SEM.

The following tables reveals the model fit indices and the regression coefficient for the relationship between Website Quality and Customer satisfaction

Table 9: Model fit Indices for CFA for Website Quality and Customer satisfaction

Variables	χ^2	DF	P	Normed χ2	GFI	AGFI	NFI	TLI	CFI	RMR	RMSEA
Website Quality-Customer satisfaction	.000	0	.000	0	1.000	.000	1.000	.000	1.000	.000	.988

All the attributes loaded significantly on the latent constructs. The value of the fit indices indicates a reasonable fit of the measurement model with data. The Goodness of Fit Index (GFI) value (1.00) is greater than 0.9 which represents it is a good fit. The calculated Normed Fit Index value (1.00) and Comparative Fit Index value is 1.000 further indicates that the model is a perfect fit model. The regression coefficients are presented in Table 10.

Table 10: The regression coefficients of Website Quality and Customer satisfaction

Path	Estimate	Critical Ratio (CR)	P	Variance explained
Website quality → Customer satisfaction	1.361	13.179	<0.001	30.1
WQ1 → Website quality	0.837	16.998	<0.001	70.0
WQ2 → Website quality	0.851	17.682	<0.001	72.4
WQ3 → Website quality	0.831	16.722	<0.001	69.1
WQ4 → Website quality	0.738	13.279	<0.001	54.5
WQ5 → Website quality	0.835	16.905	<0.001	69.8
WQ6 → Website quality	0.774	14.46	<0.001	59.9
WQ7 → Website quality	0.816	16.067	<0.001	66.7
WQ8 → Website quality	0.834	16.859	<0.001	69.5
WQ9 → Website quality	0.844	17.333	<0.001	71.2
WQ10 → Website quality	0.928	23.072	<0.001	86.1
WQ11 → Website quality	0.933	23.595	<0.001	87.1
WQ12 → Website quality	0.761	14.016	<0.001	58.0
WQ13 → Website quality	0.911	21.522	<0.001	83.0
CS1 → Customer satisfaction	0.895	21.842	<0.001	80.1
CS2 → Customer satisfaction	0.883	20.977	<0.001	78.0
CS3 → Customer satisfaction	0.874	20.381	<0.001	76.4
CS4 → Customer satisfaction	0.824	17.654	<0.001	67.8
CS5 → Customer satisfaction	0.791	16.219	<0.001	62.6
CS6 → Customer satisfaction	0.759	15.007	<0.001	57.6
CS7 → Customer satisfaction	0.895	21.842	<0.001	80.1
CS8 → Customer satisfaction	0.713	13.488	<0.001	50.8
CS9 → Customer satisfaction	0.751	14.726	<0.001	56.4
CS10 → Customer satisfaction	0.685	12.661	<0.001	47.0

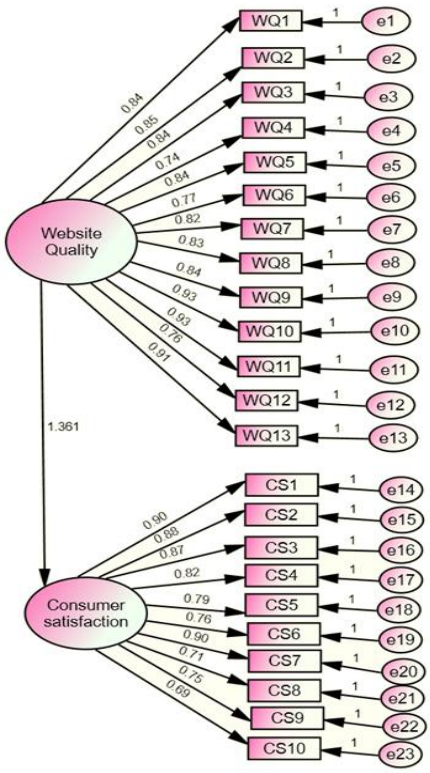

Figure 3: SEM of Website Quality on Customer Satisfaction

Here the relation between Website Quality and customer satisfaction is 1.361 which means there exists a perfect relation between them. The website quality is strongly associated with customer satisfaction. This signifies that the higher the quality of the website of food apps the more will be the satisfaction of customers.

4.3 To assess the level of customer satisfaction in MFOA usage

With this objective, the respondents were asked 10 questions on a five point Likert scale. The responses are scored as 1 for 'Strongly Disagree', 2 for 'Disagree', 3 for Uncertain', 4 for 'Agree' and 5 for 'Strongly Agree'. The total score of the 5 questions for all 200 respondents is found out, based on which we calculate the mean % score of level of consumer satisfaction $\left[MPS = \frac{MeanScore \times 100}{Maximumpossiblescore}\right]\left[MPS = \frac{MeanScore \times 100}{Maximumpossiblescore}\right]$.

This score is classified into one of the four groups as low if the mean % score is less than 35%, average, if the mean % score is between 35 to 50 per cent, good if the mean % score lies in the interval 50 to 75% and excellent in case if the mean % score is above 75%.

A one sample Z test is carried out to test the significance. The table 11, gives the Mean, SD, Mean % Score and Z value of the variable considered. (Loyd et al.,1985)

To test whether the sample information that we observe exists in the population or to verify that the level of consumer satisfaction with regard to Website Quality, the following hypothesis was formulated.

H_0: The level of consumer satisfaction with regard to the Website Quality is excellent

H_1: The level of consumer satisfaction with regard to the Website Quality is good

Table 11: Mean, Standard deviation and z value for consumer satisfaction

Variable	N	Mean	Standard Deviation	Mean % score	CV	z	p value
Consumer satisfaction	200	34.75	9.38	69.49	27.00	-4.154	<0.001

To test the above hypothesis one sample Z test was done and the result is exhibited in Table 11. From the table the p value is less than 0.05 and Z value is negative, which indicates that the test is significant. The mean percentage score level of consumer satisfaction with regard to the Website Quality is 69.49% which indicates that the level of consumer satisfaction is good. Hence the null hypothesis is rejected leading to the conclusion that the level of consumer satisfaction with regard to the Website Quality is good.

The coefficient of variation, CV= $\frac{\text{Standard deviation}*100}{\text{Mean}}$ indicates that this score is stable as the value is greater than 20%.

5. LIMITATIONS

Regardless of the effort to enrich the current understanding of MFOAs, there are some limitations on this paper, which provides opportunities for future research. Chances are that certain factors might have been omitted. As this study was conducted during the lockdown period the data was collected online which was indeed a limitation.

6. MANAGERIAL IMPLICATION OR RELEVANCE OF THIS STUDY

Since March 2020, the whole world is fighting against Pandemic and there are a lot of restrictions imposed on human life to safeguard against the dreadful disease. The new normal has altered the workplace, lifestyle and restrictions continue as lockdown and containment zone, which makes travelling impossible. People are adapting/ attuning to the change by leveraging technology and transforming to online mode. As per the restrictions imposed on dining out along with the availability of MFOAs make this industry highly competitive. In this context the Mobile Food Ordering Apps face tough competition to stay ahead and to satisfy the customers in terms of the features or characteristics of the website design. This makes this study all the more relevant than ever before.

7. CONCLUSION

This study has attempted to provide insights on the influence of the quality of websites that could shape the customer satisfaction in food apps while ordering food using MFOAs. The results of the Pearson correlation brought in the fact that there is a strong positive influence of website quality on customer satisfaction. Finally the study concluded by assessing the level of customer satisfaction which was observed to be good while using MFOA. Hence both the outcomes of this study give new dimension to marketers to evolve suitable strategies to improve the customer satisfaction and to make their Mobile food ordering app further appealing and user friendly. Nevertheless, it enables MFOA companies to identify those factors that give customers more weightage while assessing the quality of website and hence they can think of a radical change which can help them in wooing the customers to use mobile food ordering apps.

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Managing Flows and Risks in Supply Chains - A Page from Ancient Silk Route

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Abstract

Three flows – material flow, fund flow and information flow – define the reach of a supply chain to the customer. Each of these flows encounters different types of risks while fulfilling the objective of a supply chain. For the global supply chains of modern-day, flows are complex and risk perceptions are challenging. Technology aided information flows are critical for managing risks and sustaining supply chains. This study explores the theoretical aspects of flows and risks in modern-day supply chains and highlights the nature of flows in the ancient Silk Route trade. Further, it describes the nature of risks that the Silk Route trade encountered and their sources. This study explains the mitigation strategies pursued by the key actors of the Silk Route from time to time which facilitated its sixteen centuries-long sustenance.

Keywords: *Material flow, financial flow, information flow, risks, Ancient Silk Road, bullwhip effect, mitigation*

Sectoral Correlations and Interlinkages: NSE

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Sectoral Correlations and Interlinkages: NSE

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Abstract

An efficient portfolio is a well-diversified portfolio that gives the investor opportunities to earn money and provide cover against risks. Understanding the intersectoral linkages and correlations among various sectors in a stock market will help an investor to diversify the portfolio and reduce risk efficiently. This study aims at examining the underlying linkages and correlations among eight sectors in the Indian National Stock Exchange (NSE) using a Granger causality test under VAR environment. The results of the study based on nine years' data from 2009 to 2018 show that an effective portfolio can have two classifications –stocks from Pharma and Media as group one (defensive stocks) and picks from IT, Bank, Financial Services, Realty, Auto and FMCG sector as group two (somewhat Cyclical). The study further proves that the usual definition for cyclical and defensive sectors have undergone some profound changes.

Keywords: *Portfolio Diversification, intersectoral linkages, ADF Test, Granger causality.*

The investment pattern is changing from one generation to another as a result of an increase in risk-taking appetite of different generations. It was plots and land for our forefathers who were risk-averse investors, it became bank FD's, postal deposits and chit funds etc. for baby boomers who were born after the 1950's, and it is stock markets for the Millennials, born after 1980. The fundamentals of wealth creation have made the stock market investments and portfolio diversification attractive for the stock market players. The famous example of Wipro ltd, wherein a meagre Rs. 10000 worth of investments made in the stock in the early 1980's grew to a whopping 741 crores in 2019 (Rangarajan, 2019). This example showcases another gem of investment called value-based investing. The golden principle of wealth creation- "the value-based investing" framed by ace investor Benjamin Graham coupled with appropriate portfolio diversification strategies will make the investments grow by leaps and bounds in the long run.

Stock Market plays a pivotal role in the growth of the industry and commerce in a country. As stock markets also signal the growth of an economy, government and central banks keep a close watch on the ups and downs in the stock market. The stock market is important for the industry as well as for investors. As far as investors are concerned, their investment preference always relates to stocks of those sectors with maximum returns and minimum levels of risks. Construction of a portfolio of multiple assets helps investors get maximum returns at a given level of risk (Abreu & Mendes, 2009). However, the large input data requirement and enormous time make the risk-return analysis cumbersome. In this context, index models for portfolio selection is a reliable method as the overall performance of the stock markets is usually tracked and reflected in the performance of various stock market indices.

Information about stock market helps the investor to invest in the markets with potential diversification benefits. Here an investor can increase return or reduce risk by diversifying his investment portfolio in segmented stock markets. Instead of orienting equity investment to one company or sector, the best option is investing in large mid and small-cap stocks across high growth stable sectors (Vlastakis & Markellos, 2012). Other studies related to the amalgamation of the stock markets and the financial markets also helps investors figure out the benefits and limitations of portfolio diversification (Ahmed, 2011). Another important aspect of being considered is the international transmission of shocks among national stock markets which widens the scope of stock market integration or segmentation. The policymakers who are well informed of stock market integration or segmentation could clearly understand the sectoral connections which help them take precautionary measures to prevent the systemic shocks to ensure the stability of the economy (Sharma & Dhiman, 2016). With the liberalisation of economies, easement of legal barriers, increase in the number of transnational companies in the countries etc, portfolio diversification seems to be a challenge even to the most expert investors. Along with this, the high uncertainty in the financial and economic environment across the world makes it look like an almost impossible task.

Allocation of capital to stocks from different sectors is subject to the performance and anticipated growth of the concerned sector. Thus, the investors could create a portfolio by this sectoral allocation and keep on revising this portfolio by favourable new information from the concerned sector. The investors can observe the performance of various sectors from the respective sectoral indices. The success of investors, fund managers and other market players depending on their knowledge on market integration. Studies on stock market integration at the sectoral level highlight the importance of sectoral analysis as it determines whether the impact of the crisis on the main indices is consistent at the sectoral level as well (Arvind, 2017).

The investor selection of specific stocks depends on their risk-return perspectives. Measured risk brings prospects of higher returns. While operating riskier investments, risk management strategies should evolve to mitigate losses. Instead of orienting equity investment to one company or sector investing in large and small-cap stocks across high growth and the stable sector is apt action. While evaluating a stock for investment, study about its price movement and financial health of the company is of utmost importance (Jorion, 2000). Based on these cautions, the performance of stock markets can quickly identify and judged by an investor by looking at its market index. The market index provides a yardstick to measure the performance of a particular stock and also provide investors for forecasting future trends in market movements. Thus, choice of individual stocks within each of the selected area could be made by the individuals or portfolio managers based on analysis which generally aims at accrual of higher returns, given a risk level (Cowles, 1944).

Sectoral linkage has become one of the most discussed topics in the portfolio creation process (Yilmaz et al., 2015; Sieczka & Hołyst, 2009; Garas & Argyrakis, 2007) The linkage among various sectors in Indian stock market should be analysed on the basis of sectoral interlinkages. The studies of sectoral inter-linkages are all the more important for a developing country like India so that positive growth stimuli among sectors could be identified and fostered to sustain the economic growth momentum. Identifying sectoral linkages and correlations in the stock market would also help the investors diversify their investment portfolio, thereby reducing the risk of making a huge loss by 'putting all eggs in a single basket'. This study has used a multivariate Granger causality test by fitting a Vector Auto Regressive (VAR) model to assess the mutual causal effect among eight sectoral indices in National Stock Exchange (NSE) namely, IT, PHARMA, REALTY, MEDIA, AUTO, BANK, FINANCIAL SERVICES and FMCG for a period spanning 10 years starting from January 2009. The results of the Granger causality test would help descry the unobserved interlinkages among these eight sectors and would provide useful insights to the investors to diversify their existing investment portfolios.

Review of literature

There are a number of studies examining the inter-sectoral correlation among different sectors in the stock markets around the world. The relevant literature pertaining to this study are discussed here.

The interrelationship among sectoral indices in Athens stock market was examined by Patra & Poshakwale (2008). They used cointegration to find evidence for long-run relationship and variance decomposition to test the short-run relationship. Their results show that the banking sector was strongly correlated with other sectors in the short run, and it accounted for the major share of volatility and returns from the other sectors.

The long-run and short-run sectoral correlation in the Bombay Stock Exchange (BSE) was investigated by Noor et al. (2014), and the findings portray that except Bankex-IT and Consumer durables-Realty, no other long-run relationship was observed. The evidence for the short-run relationship was also limited. The stock market of Cyprus also showed similar trends where there was little evidence for bivariate cointegration in the long run and no active sectoral correlation in the short-run (Constantinou et al., 2008). Another study conducted in China to check the inter-sectoral correlation in Chinese stock exchanges gives evidence for strong interdependency among sectors (Wang et al., 2005).

Many studies showed that the increasing interdependency among countries might significantly reduce the benefits of portfolio diversification, especially during bearish market (Olienyk et al., 2002 and Glezakos et al., 2007). A study conducted by Ahmed et al. (2018) analysed the correlation in the sectoral indices in Colombo stock exchange using a multivariate cointegration and granger causality test. The study aimed at creating a diversified portfolio to reduce risks. The results show that the sectors were not integrated with each other, and the Colombo stock exchange offers good diversification opportunity to the investors.

Siddique (2009) asserted that the understanding of the global stock market composition is significant for both investors and portfolio managers in India. The study also pointed out that the individual and institutional investors should grasp a healthy diversified portfolio to decrease risk.

Sarkar et al., (2009) studied the interrelation between Indian stock market with other markets around the world and identified a strong correlation between the global stock market and the Indian stock market with the impact of US stock market on India being the most prominent.

The study of Bhalla (2011) shows that the extent of stock price volatility is influenced by the extent of integration between the domestic and international capital market as well as regulating framework governing the stock market. The behaviour of stock prices in India during the nineties was influenced by the net investment by FII and trend in the international stock exchange.

Raj & Dhal (2008) analysed the integration of India's stock market with the global and major regional market and found that there is a lack of evidence of integration of stock market in terms of local currency. This situation gives rise to concerns that the Indian stock market integration to be a success only if there is an adequate role of domestic investors.

The study conducted by Kaur et al. (2009) identified a bivariate relationship between manufacturing and agriculture sector in India. Further assessing the interlinkages between sectors, the study shows long-run association among banking, manufacturing, trade hotels, transport and communication sectors.

Harvey (1995) suggests that the improvement in market efficiency is consistent with increasing integration with world markets. But, Kim & Singal (2000) viewed that the national stock markets are different since they operate in the economic and social environments of different countries. Accordingly, a country's financial market functions when prices reflect the fundamentals and risks of other countries. Linkages among fundamentals across nations result in financial integration.

Chebby (2010) examined the link between agriculture growth and other sector growth of the economy such as manufacturing transportation, tourism, telecommunication, commerce and service sector using the Johansen Co-integration and Granger Causality in the case of Tunisia and concluded the existence of a long-run relationship between agricultural growth and other sectors of the economy.

Ahmed (2008) in his study, explored how stock prices in India led economic activity and movement in the interest rate, which significantly influences the stock prices. The study confirmed that the Indian stock market seemed to be driven not only by actual performance but also by expected potential performances.

The general lack of interest of the stock market in India in the important basic capital and intermediate good in the aftermath of the excessive attention paid to computer, software, telecommunications, electronic media, pharmaceuticals and consumer non-durables. This happens so due to investors preference for quick returns. If the stock market does not support the basic capital industries, it will undermine the efforts of the state in the form of development financial institutions. (Rao, Murthy & Ranganathan, 1999). In the case of crisis-hit ASEAN countries, the efficient capital market is more important as these are struggling to reduce the dependency on bank loans (Click & Plummer 2005).

Barari et al. (2008) showed the macroeconomic implication of stock market integration and more specific aspects of integration, such as understanding the time-varying nature of market integration among developing countries. The relationship between macro-economic variables and the stock market is dynamic and requires extensive and frequent studies to interpret the interlinkages.

The increased globalisation of financial markets resulted in a situation of smaller markets following larger markets. Aggarwal & Rivoli (1989), in their study, examined the relationship by concluding that the Asian market followed the US market movements on a day-to-day basis. This was confirmed by another study which showed that the greater the international integration of equity markets, the higher the degree of correlation among national equity prices (Cashin et al., 1995).

Most of the studies exploring the short run sectoral interdependency in stock markets used a Granger Causality test. This study also follows suit to investigate the short-run interrelationship among sectors in the National Stock Exchange (NSE) of India.

Materials and Methods

The data used for the study comprised the daily returns of the eight sectoral indices of NSE from 1st April 2009 to 28th March 2018. The sectors included in the study are IT, PHARMA, REALTY, MEDIA, AUTO, BANK, FINANCIAL SERVICES and FMCGs.The log difference of the data was taken using the following equation prior to the analysis.

R=Ln(P1/P0) …………………………..……………….(1)

Where, R is the returns, P1 denotes the current day's price, P0 shows the price for the previous day and Ln denotes the log transformation of the data.

A prerequisite for testing the cause and effect relationship using the Granger Causality test among various sectoral indices is to ensure that all the variables are stationary. The ADF test (Dickey & Fuller 1981) was conducted to check whether the variables contained unit root or not. The optimal lag structure was determined by AIC (Akaike information criteria). This empirical analysis is conducted based on the assumption that the time series data used for mathematical modelling are not stationary. Stationary time series are those in which the statistical properties will remain constant over a period of time.

Kayral & Karacaer (2017) had used the Granger Causality Wald test to find the cause and effect relationship of US stock market returns and Exchange rate changes on the stock market volatilities in emerging economies.

This study also uses a granger causality wald test to assess the short-run causal effect among the variables. For testing the relationship, first, a vector autoregressive model (VAR) was fitted, and then the Granger causality test was conducted for each equation in the VAR model. VARs are a system of

equations that depend on the outcome of other variables. The following equations show how yt and xt attain value from the lags of the x and ys.

$$yt = \beta 10 - \beta 12xt + \gamma 11yt-1 + \gamma 12xt-1 + uyt \ldots\ldots\ldots\ldots\ldots\ldots(2)$$

$$xt = \beta 20 - \beta 21yt + \gamma 21yt-1 + \gamma 22xt-1 + uxt \ldots\ldots\ldots\ldots\ldots\ldots(3)$$

Granger causality can be conducted by following a three-step procedure.

At first we regress y on y lags without considering the lags of x.

$$yt = a1 + X\,m\,j=1\ \gamma j\ yt-j + et \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(4)$$

Secondly, we add the lags in x and regress again

$$yt = a1 + X\,n\,i=1\ \beta i\ xt-i + X\,m\,j=1\ \gamma j\ yt-j + et \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(5)$$

Finally, we test the null hypothesis that $\beta i = 0\ \forall\ i\ u$, using an F-test.

Figure 1 shows the time-series line graphs for each sector with the range of variation prior to the log difference transformation.

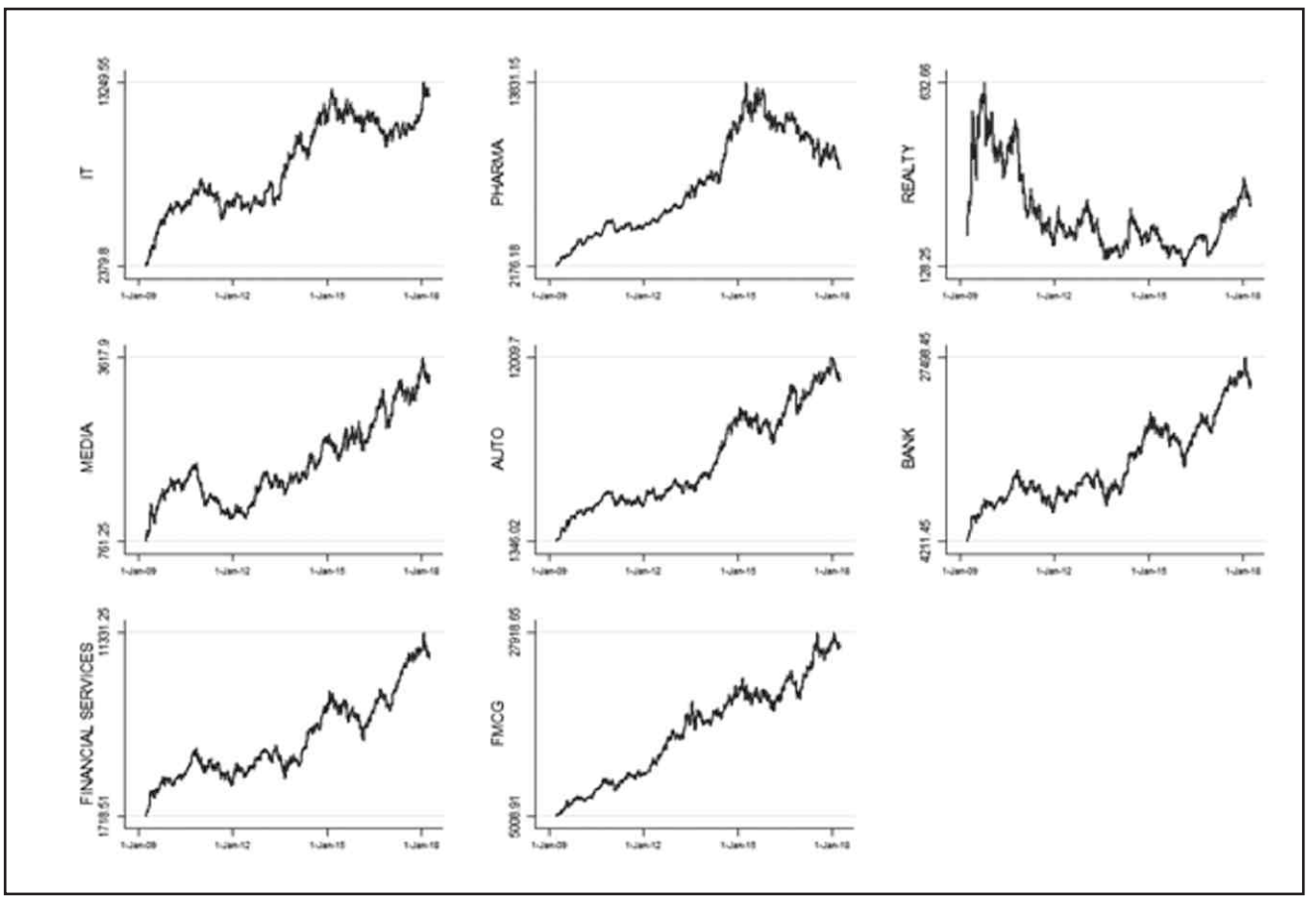

Figure 1. Sectoral Indices Line Graphs

The descriptive statistics for the variables along with the Shapiro Wilk normality tests are given in Table 1.

Table 1. Descriptive Statistics

Variable	IT	PHARMA	REALTY	MEDIA	AUTO	BANK	FIN SERVICES	FMCG
Mean	0.00077	0.00063	0.00015	0.00068	0.00097	0.00082	0.00083	0.00076
Std. Dev.	0.01387	0.01135	0.02412	0.01457	0.01317	0.01574	0.01498	0.01127
Skewness	-0.1246	0.01601	0.03867	0.30629	0.47054	0.73399	0.87895	-0.0143
Kurtosis	13.2668	10.3373	7.8991	7.2243	10.002	11.0619	13.66	6.9356
Shapiro-Wilk (W)	0.91685	0.95365	0.95993	0.97133	0.96325	0.95338	0.94525	0.96479
P Value	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Table 1 shows the results of the descriptive statistics along with the normality test results. From the results it could be seen that the mean returns of AUTO, BANK and FINANCIAL SERVICES were above 80% and outperformed the returns from other sectors. Except for the IT sector, all other sectors showed positive skewness. The values of kurtosis for all the variables under study are positive. The Shapiro Wilk normality test result shows that the p value for all the variables are 0.00. Hence, we reject the null hypothesis that the data under study follows normal distribution.

Table 2. Augmented dickey Fuller Test (ADF Test)

Variable	Test Statistic	P Value	Critical Values		
			1%	5%	10%
IT	-35.27	**0.000**			
PHARMA	-34.59	**0.000**			
REALTY	-33.06	**0.000**			
MEDIA	-33.26	**0.000**	-3.43	-2.86	-2.57
AUTO	-30.66	**0.000**			
BANK	-31.93	**0.000**			
FINANCIAL SERVICES	-31.916	**0.000**			
FMCG	-34.947	**0.000**			

Table 2 shows the result of ADF test. From the result it could be seen that all the variables are having lesser Test statistic than the critical values which denotes the stationarity of data sets. Data was made stationary as a prelude for doing the causality test.

Table 3. Granger Causality Wald Tests

Dependent Variables → / Independent Variables ↓	IT	PHARMA	REALTY	MEDIA	AUTO	BANK	FIN SERVICES	FMCG
IT		1.06	**8.33***	1.23	**11.9****	2.28	**7.71***	2.24
PHARMA	1.97		3.58	3.131	0.846	0.876	1.91	0.1351
REALTY	3.13	2.13		0.292	0.194	0.768	0.259	0.052
MEDIA	0.86	3.55	1.235		5.81	1.57	2.72	1.6
AUTO	3.29	3.35	2.614	1.25		0.664	0.476	4.572
BANK	**5.75***	1.63	**6.34***	1.13	4.84		1.334	1.6
FIN SERVICES	**8.23***	1.67	**8.26***	1.63	4.81	**6.14***		0.748
FMCG	2.26	2.08	2.56	0.393	**13.9****	3.14	**5.92***	

*p < 0.05, **p < 0.001.

Usually, the market treats IT and Pharma stocks as paired stocks and expects them to move together. But, contrary to the researchers' expectation, Pharma index for the given period was not moving along with IT. From our analysis, it is clear that Pharma sector still remains a defensive bet for the investors as it doesn't have any correlation with other sectors and hence could be made a part of investors' portfolio to balance the volatility.

Study further points out that IT sector stocks have lost the tag of a defensive investment as it has become cyclical in nature and is seen moving along with Realty, Automobile and Financial Services sector. This might be due to the following factors:

- The share of IT companies from the domestic market is increasing, and there is a shift in the trend wherein the domestic economy has started contributing more towards their bottom line. (Singh, 2019)
- Overseas business exposures of IT firms have started showing a bearish trend.

It is interesting to note that the performance of Financial sectoral index could be used for predicting the performance of the banking index. It may be due to the contagion effect. For instance, the issues in the companies like IL&FS, DHFL etc. did trigger a mass correction in the market values of banking stocks as most of the banks are having exposure in Financial service industry (either in the form of loans or investments). In financial terms, The IL&FS group had a systemic borrowing of nearly Rs 91,000 crore. Out of which, it has raised Rs 57,000 crore through bank loans. (Mudgil, 2018)

FMCG and Automobile stocks are showing the strong connection and hence cannot be used together (in larger proportions) for portfolio creation. From the study, it is understood that to be on a safer side, the portfolio should include stocks showing no connection with other sectors (Pharma, Media and FMCG) on one side and stocks showing dependence on other sectoral indices on another side. (realty, financial services etc.)

An ideal portfolio as per this study should constitute stocks from

1. Pharma and Media (as defensive stocks) and
2. all other sectors (as cyclical stocks)

The ideal proportion of the defensive and cyclical stocks can change from investor to investor.

Conclusion and future research directions

Our study has given an approximate solution for portfolio diversification to be made in NIFTY 50 based markets using VAR Granger causality test. The term "approximate solution" requires special emphasis because no models or trend forecasts will be able to predict the market with cent per cent accuracy. The present study was successful in explaining the changing dynamics of various sectors and suggesting the appropriate changes to be made in the portfolio based on the NIFTY 50 momentum changes. The major findings of the study imply that an efficient portfolio would consist of 50% stocks from pharma and media as defensive stocks and 50% from the rest of the six sectors as cyclical stocks.

One of the limitations of the study is that the analysis was primarily done for a period of 10 years. The study can be expanded by including data from the latest financial year. Interlinkage of various sectors of NIFTY 50 have been analyzed in the current study without considering the dynamics of various macro-economic variables. This limitation provides further scope for the study. The long term relationship among various sectors and the spillover effects among various sectors also provide scope for further research.

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Indian NBFC MFIs Vs. Bangladeshi NGO MFIs

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ABSTRACT:

MFIs are the pivotal organizations in each country that make individual microcredit loans directly to villagers, micro entrepreneurs, impoverished women and poor families. NBFC MFIs have been playing a significant role in taking forward the financial inclusion agenda of the Government of India. Bangladesh which is the birth place of microfinance and also pioneer in the world for applying microfinance has NGO form of MFIs. This paper aims to compare the financial performance of NBFC MFIs in India and NGO MFIs in Bangladesh. The study is primarily based on secondary data. The variables, such as institutional characteristics, financing structure, outreach indicators, overall financial performance indicators, revenue and expenses, efficiency and risk and liquidity have been considered to analyse the financial performance of 27 Indian NBFC MFIs and 23 Bangladeshi NGO MFIs. The Mann-Whitney U test has been used for analyzing the data. It is found that the Indian NBFC MFIs stand better than the NGO MFIs of Bangladesh in many aspects, though Bangladesh is the place of origin for the concept of microfinance and Microfinance Institutions.

KEY WORDS: Microfinance, microfinance institutions, MFIs, Financial Performance, India, Bangladesh

1. INTRODUCTION:

The poor, like the rest of society, need financial products and services to build assets, stabilize consumption and protect themselves against risks. Microfinance serves as the last-mile bridge to the low-income population excluded from the traditional financial services system and seeks to fill this gap and alleviate poverty. Microfinance loans serve the low-income population in multiple ways, by: (1) providing working capital to build businesses; (2) infusing credit to smooth cash flows and mitigate irregularity in accessing food, clothing, shelter, or education; and (3) cushioning the economic impact of shocks such as illness, theft, or natural disasters.

Moreover, by providing an alternative to the loans offered by the local money lenders priced at 60 per cent to 100 per cent annual interest, microfinance prevents the borrower from remaining trapped in a debt trap which exacerbates poverty. The microfinance model is designed specifically to help the low income population overcome typical challenges such as illiteracy, lack of financial knowledge and deficiency of collateralizable assets. At the same time, it takes the advantage of existing community support systems and networks to encourage financial discipline and ensure high repayment rates.

THE RELATIONSHIP BETWEEN EMOTIONAL QUOTIENT AND WORKPLACE HAPPINESS*

BY

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ABSTRACT

The current pandemic has brought the focus of research on the psychological well-being of employees in organisations. There is a need for happier workplaces and emotionally intelligent employees who are motivated and engaged to get best results from each person. The present study is done with the objective to know the relationship between Emotional Quotient and Workplace Happiness among employees working in software companies. Results indicate that employees with high Emotional Quotient tend to be happy and productive at workplaces.

KEYWORDS

Emotional Intelligence, Emotional Quotient, Job Satisfaction, Positive Attitude.

Introduction

Emotional intelligence (EI) has been increasingly found in the social psychology literature. It has become of widespread interest to psychological research in recent years. Emotional intelligence is one of the important factors that determine success in an employee's life and psychological wellbeing. An employee having certain level of emotional intelligence will take a position when confronted with positive or negative life events and will compromise with them. Previous studies have shown that a person who has emotional intelligence gives order and stability to his life in such a way that with high emotional intelligence, the person will experience less negative events in his/her personal life or showcase diminished to zero manifestations of one's inner conflicts amidst their place of employment and in between co-workers. Happiness comprises of

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three essential components viz, Positive emotions, life satisfaction, lack of negative emotions, and positive relations with others, having purposeful life, personal growth and love of others are components of the happiness. A key conclusion is that happiness and the processes associated with it and the influence of emotional quotient levels of the respective individuals depend on perspective and the level of analysis. The inferences derived from the study will provide clear insight into the factors that contribute towards employee workplace happiness and how the emotional quotient of employees affects their perception of workplace happiness thus drawing up a picture of how can one choose to act in order to improve their state of mind thus resulting is improved organisational performance, with addition to suggestions as to how managers can improve their own performance as well as that of their subordinates thus steering the corporates towards achieving a competitive advantage over others.

1. The Concept

1.1 Emotional Quotient

The emotional quotient (EQ) is a behavioural model in HR which has gained importance with Daniel Goleman's 1995 book called "Emotional Intelligence". The early psychologists Howard Gardner (Harvard) Peter Salovey (Yale) and John Mayer (New Hampshire) developed the emotional intelligence theory during 1970 and 1980's. The concept of emotional intelligence is increasingly relevant in today's organizational development and developing people, because these components provide a way to understand and assess people's behaviour, management styles, attitudes, interpersonal skills and human potential. Emotional intelligence has helped in human resource planning, job analysis, recruitment, interviews, selection procedure, and customer relations etc. The success of human endeavour does not depend on Intellectual Quotient (IQ). The persons having highest score of IQ may lack in social and interpersonal skills and thereby they lag behind in their performance.

EQ requires awareness and management of our own emotions first and then understanding and managing emotions of others. It is said that persons having emotional maturity are like parents to their emotions: acknowledge their needs, express emotions, indulge in them, where appropriate encourage their creativity and yet restrain them from exhibiting foolish, destructive and discourteous behaviour.

The EQ is a measure of emotional intelligence of a person. The imbalance in EQ causes stressful situations. In order to cope up with such situations, the interpersonal skills and competencies such as self-management, social skills etc. are put to test. In recent years, most of the organizations seek employees who are ambitious, reliable and trust worthy. These elements determine not only whether employees will get things done but also whether they will fit in with organization culture and collaborate with the team well.

2.2 Workplace Happiness

Workplace happiness is also known as happiness at work. Fisher (2010) defined workplace happiness as a construct that emulated pleasant judgments (positive attitudes), pleasant experiences (positive feelings, moods, emotions,) or positive affective experience in the workplace. In Pryce-Jones' (2011) book, Happiness at work: Maximizing your psychological capital for success, workplace happiness has been described as a mind-set which allows an employee to maximize performance and achieve their potential. They can do this by being mindful of the highs and lows when working alone or with others.

Happiness is decided by personal characteristics and social environment (McNulty, 2012). Workplace happiness has narrowed the social environment to the workplaces, which assesses mostly the happiness level of employees influenced by their work and reflected in the workplace. On an average, adults spend as much as a third of their waking life in work. Research indicates that a quarter of the variation in adult life satisfaction can be accounted for by satisfaction with work. (Campbell, Converse & Rodfers, 1976) These statistics justify the effect of work to employee's happiness and reiterate the importance of workplace happiness to a person.

2. Purpose of the study

The purpose of the study is to determine the relationship between emotional quotient of the individual employee and the level of workplace happiness among the employees' to determine whether there is any correlation between the level of emotional intelligence and how happy the employees are in their respective work setting. The study aims at demonstrating a positive relationship between an employee's psychological state by

comparing various factors in terms of emotional quotient and extent of workplace happiness.

3. Literature Review

Studies from various others sectors have been picked up to build the idea that emotionally intelligent organizations have higher levels of performance outputs, job satisfaction, profitability, managerial effectiveness, customer satisfaction, employee retention, etc. irrespective of the sector.

Ealias and George [2012] found a significant positive correlation between emotional intelligence and job satisfaction, thereby establishing that employees with high EI experience more job satisfaction.

Salovey and Mayor [1990] found that emotional intelligence allows people to better understand and manage their emotions and others too. This will help people set goals and achieve them thereby experience happiness at work

In another study carried out by Oriole and Cooper [1997] it was shown that understanding and controlling emotions play significant role in gratifying one's life and work environment.

Panda, E. [2013] in her studies found that majority of the employees have average to high emotional intelligence in IT sector in Odisha. She further suggests that being emotionally intelligent improves not only self-awareness but also harmonizes and organizes the surrounding environment. Good team communication, being able to empathize, intrinsically motivated, self-managed and refined social skills come handy in such environment.

Kohli, K.[2012] in her research paper has opined that people with higher EQ are easier to work with, as they understand the emotional needs of other. They support others and help out in solving others problems. This facilitates smooth flow of work and few arguments, conflicts and misunderstandings.

Results of a research of top ten companies found that high level of Emotional Intelligence among the employees accomplished more positive work culture by their behaviours (D. Singh, 2001)

Feldman [2001] argues that abilities in EI might help explain why people with only modest intelligence (IQ scores) can be quite successful, despite their lack of traditional intelligence.

4. Objectives

1. To know the level of Emotional Quotient of employees in the study organisations.
2. To know whether there is a difference in Workplace Happiness among employees
3. To study the impact of Emotional Quotient on Workplace Happiness among employees.

5. Methodology

The study follows a research design that is descriptive in nature as it is able to describe how the emotional quotient of individuals can shape an individual's workplace happiness A sample size of 75 respondents were selected using convenient sampling from select software companies. A structured questionnaire was used for collecting data with two questionnaires: A model of Emotional Quotient Self-Score questionnaire and The workplace happiness questionnaire. Data obtained has been analysed by using simple statistical techniques such as Weighted Average Method, Independent samples t-test and Pearson's Coefficient of Correlation.

6. Limitations

Source of data collection was limited since many of the employees were very busy and some were not available as they were on deputation. The time period of one month for conducting the study had posed restrictions on the amount of data that could be collected and analysed. There is a possibility for personal bias of the respondents to have an effect on the accuracy of the study as they may have not given full and correct information due to their lack of interest, their lack of time.

7. Results

The data collected has been analysed and the results presented in this section.

Table – 1: Demographics of the respondents

Demographics	Group	Frequency	Percentage
Gender	Male	68	91%
	Female	7	9%

Age	Below 35 years	36	48%
	Above 35 years	39	52%
Experience	Less than 5 years	9	12%
	More than 5 years	66	88%
Department	Accounts	4	5%
	Administration	7	9%
	Human Resources	3	4%
	Software Developers	61	82%

Source: Primary data

Table - 1 shows the demographics of the respondents. Majority of the respondents are male (91%) and 9% of the respondents were female. Age-wise the respondents were almost equally distributed as below 35 years and above 35 years. Majority (88%) of the respondents were having more than 5 years of experience and 12% had less than 5 years of experience. Most of them were software developers in the study organisations.

Table - 2: Level of Emotional Quotient among the respondents

Emotional Quotient	Frequency	Percentage
High	33	44
Low	42	56
Total	75	100

Source: Primary data

According to Table - 2, 56% of the respondents have low EQ. These respondents have difficulty in coping with work stress and find it difficult to cope up with work schedules and managing good relations with colleagues and superiors. The same table shows that 44% of the respondents have high level of EQ. These respondents show control over their emotions. These employees have been working in the same organisation for more than 5 years.

Table - 3: Mean values of Components of Emotional Quotient

Component	Mean value
Self-Awareness	3.5787
Self-management	3.6813
Social Awareness	3.9607
Social Skills	3.9920

Source: Primary data

According to Table - 3, respondents show more strong Social skills followed by Social Awareness, Self-management and Self-awareness. Social skills are necessary to maintain good relations within the organisation. Social awareness helps the respondents to understand the emotions and behaviours of others in the organisations

Table - 4: Factors contributing to Workplace Happiness among respondents

Factor	Mean value
Satisfaction	4.0533
Time spent at Work	2.9700
General Job Characteristic	3.7786
General Working conditions	3.7599
Social Climate	3.7556
Extent of work involvement	3.4583
Relationship with team members	3.7511
General Life Questions	3.7311

Source: Primary data

According to Table - 4, respondents found Job satisfaction as the most important factor contributing to Workplace Happiness followed by General Work characteristics (work motivation and good use of one's time) and General Working conditions (good relationship with managers and pleasant working conditions). Respondents opined that Time spent at work (at times feel bored and frustrated) is least contributing factor to Workplace Happiness.

Independent samples t-test:

Objective: To know whether the Workplace Happiness among respondents differ between levels of EQ of respondents. For these purpose Independent samples t-test at 95% confidence level is applied. The Independent samples t-test compares the means of two samples (respondents in high and low level of EQ). The present study used two-tailed test of significance. The two-tailed test examined whether the mean of one distribution differs significantly from the mean of the other distribution, regardless of the direction (positive or negative) of the difference.

Hypothesis: There is a difference in Workplace Happiness between High and Low level of EQ. The assumption in this analysis is that equal variances in mean values exist.

Table - 5 showing difference in mean value of Workplace Happiness between High and Low level of EQ

	Level of Emotional Quotient	N	Mean	Std. Deviation	Std. Error Mean
Workplace Happiness	High	33	153.9697	15.92852	2.77280
	Low	42	145.8571	18.14786	2.80028

Source: Primary data

Table – 6: Independent samples t-test for Workplace Happiness

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Workplace Happiness	Equal variances assumed	.543	.463	2.026	73	.046
	Equal variances not assumed			2.059	72.059	.043

Source: Primary data

Table - 6 shows the results of the Independent samples t-test of Workplace Happiness among respondents. The p value of Levene's Test shows that the two variances did not differ significantly. The p value of the t test of Workplace Happiness is less than 0.05. The hypothesis is accepted. The mean values of the respondents in case of Workplace Happiness differed significantly [Table - 5]. From the Table - 6, it can be concluded that there is difference between the respondents with high and low level of EQ in experiencing Workplace Happiness.

Correlation Analysis

Hypothesis: There is a relationship between Emotional Quotient and Workplace Happiness among respondents.

Table - 7: Correlation between Emotional Quotient and Workplace Happiness among respondents

		Emotional Quotient	Workplace Happiness
Emotional Quotient	Pearson Correlation	1	0.681**

	Sig. (2-tailed)		0.000
	N	75	75
**. Correlation is significant at the 0.01 level (2-tailed).			

Source: Primary Data

Table - 7 shows the correlation Emotional Quotient and Workplace Happiness among respondents. The correlation value r = 0.681 is significant at p<0.01level. The Hypothesis is accepted. This means that there is 68.1% relationship between Emotional Quotient and Workplace Happiness among respondents

Regression analysis

Objective: Impact of Emotional Quotient on Workplace Happiness among respondents

Table - 8: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.700[a]	0.490	0.461	12.90038
a. Predictors: (Constant), Self-Awareness, Self-Management, Social Awareness, Social Skills				

Source: Primary Data

Table - 8 shows the impact of Emotional Quotient on Workplace Happiness. The R value of 0.700 shows the strength of the relationship between Emotional Quotient and Workplace Happiness. The R^2 value of 0.490 indicates that 49% of the changes in Workplace Happiness are accounted by Emotional Quotient.

Table - 9: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11188.959	4	2797.240	16.808	.000[b]
	Residual	11649.388	70	166.420		
	Total	22838.347	74			
a. Dependent Variable: Workplace Happiness						
b. Predictors: (Constant), Self-Awareness, Self-Management, Social Awareness, Social Skills						

Source: Primary Data

The ANOVA test as shown in the Table - 9 confirms the impact of Emotional Quotient on Workplace Happiness among respondents. The F value is 16.808 at p-value less than 0.05.

Table - 10: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	27.851	15.394		1.809	0.075
	Self-Awareness	1.659	0.569	0.349	2.914	0.005
	Self-Management	.560	.529	.141	1.058	.293
	Social Awareness	.116	.449	.035	.258	.797
	Social Skills	1.035	.432	.293	2.397	.019
a. Dependent Variable: Workplace Happiness						

Source: Primary Data

The impact of Emotional Quotient on Workplace Happiness is shown by the t – value (1.809) in the Table - 10.

The regression equation based on the above table is

$Y = a + bX$

Workplace Happiness = 27.851 + 1.659 Self Awareness + 1.035 Social Skills.

From the regression equation it can be understood that Self Awareness and Social Skills influences Workplace Happiness to the extent of 165% and 103% respectively.

8. Findings:

The study was conducted to find the relationship between Emotional Quotient and Workplace Happiness among employees of select software companies. The analysis presented the following findings.

Employees with low emotional quotient were more in number than high emotional quotient. Social skills and Social Awareness were the most important components of emotional quotient. The employees were more effective in maintaining good relations with all members in the organisation.

There is a difference in Workplace Happiness between employees with high and low level of emotional quotient. The analysis revealed that employees with high emotional quotient are instrumental in creating happy workplaces. They are in a position to influence the ambience of their workplaces to make it healthy and vibrant.

Emotional Quotient of the employees has a significant relationship with Workplace Happiness. Self-Awareness and Social Skills contribute to almost half the Workplace Happiness. Research indicates that a fifth to a quarter of the variation in adult life satisfaction can be accounted for by satisfaction with work. (Campbell, Converse & Rodfers, 1976). Further Oswald et al (2009), Freeman (1977), found that happiness at workplace can help employees to achieve career success, enhance their job satisfaction, and encourage them to work harder; and at the same time, the turnover rate of happy employees can decrease. Companies can achieve higher profitability by decreasing the employee healthcare costs.

9. Conclusion

The significance of emotional quotient in relative measure to workplace happiness is the underlying aim of the study conducted at select software companies. Happiness at the workplace can have an impact at both the company and the country level. It would be unwise to ignore the importance of and role played by workplace happiness within the confines of the workplace environment. The study paved its way through analysis and interpretation of the various intricacies of the individual employee, how their immediate environment is of influence to their psychological state, how their work lives revolve around many motivation factors, most importantly of which and the major component of the study i.e., Workplace happiness. The emotional stability of the individuals at the workplace is imperative to operate a stress free and conflict free work environment.

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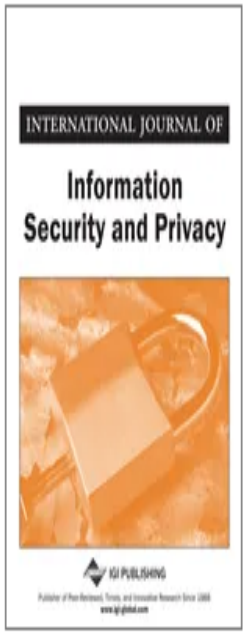

Review on Cryptography and Network Security Zero Knowledge Technique in Blockchain Technology

Anjana S. Chandran

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Abstract

A huge amount of data has been generated every day across the world by organizations with the emergence of the World Wide Web, social networks, along with e-commerce applications. To safeguard the network along with data transmission that occurs over a wireless network, cryptography along with network security (NS) is utilized. In data transmission over a wireless untrustworthy network, securing data is a major concern. Providing security to the wireless sensor networks is highly significant; NS provides security not only to the end system but also to all over the network system. Consequently, NS, cryptography, present progress in NS, linear cryptanalysis (LC), together with differential cryptanalysis (DC) are explicated in this work. The outcomes of the encryption time (ET) versus file size for data encryption standard (DES), advanced encryption standard (AES), 3DES, Rivest-Shamir-Adleman (RSA), blowfish, and the decryption time (DT) versus file size for RSA, AES, modified RSA (MRSA), and nth degree truncated polynomial ring units (NTRU) are also evaluated in this paper.

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The awareness and the usage of digital devices among senior citizens- A study with special reference to Kerala in India

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ABSTRACT: *The Digital India programme focuses transforming India into a digitally empowered society. Today, Indians are confronted with a plethora of technological services and digital devices. Such services offered on digital platforms not only enhance intellectual engagement and provide increased safety but also expedite tedious processes such as money transfers thereby bettering the quality of life. This transformation process is challenging in a country like India, where more than 300 million citizens do not possess credit / debit cards or smart phones and are also not financially literate enough to handle PINs, passwords etc. and their implied securities Although the introduction of these services hold great promise for all, older adults find it difficult to adapt to these new techniques. Seniors often lack knowledge about the usage of new technologies and so are unable to benefit from several government schemes that are easily accessed through digital means. Thus, it becomes imperative to understand the level of awareness they possess regarding the usage of devices. This study aims to identify the relevance of the utilization of digital devices and the challenges faced by senior citizens in technology usage among senior citizens.*

KEYWORDS: *Ageing well, Dependency ratio, Digital Revolution, E-literate, Digital literacy, Digital India, Digital Devices, Senior Citizen.*

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I. INTRODUCTION

According to a report by the United Nations Population Fund and Help Age India , India had 90 million elderly person in 2011, with the number expected to grow to 173 million by 2026[1]. Among the total population nearly one third can be classified as senior citizens. As adults age, they respond more slowly to simple stimuli and take longer to learn new material, thus potentially decreasing their ability to adapt to changes. As they age their vision, speech, and hearing can become compromised. In addition, they often exhibit larger temporal variations in sensory, motor and abstract cognitive abilities than younger and middle-aged adults [2]. Until recently, technology could not address most of these decline in potential adaptability. However, as computers become powerful and easily embedded in other objects and processes, they provide the opportunity to construct technology that can greatly augment the adaptability and functionality of the older adult user. The utilisation of digital technologies and services offer opportunities for the delivery of broad, flexible interventions with older adults. The information providing capacity of modern technologies allows the elderly to handle the issues of modern life with ease.

II. OBJECTIVE

One of the biggest barriers of the implementation of the Digital India programme is the lack of familiarity of technology usage. Government services, benefits and schemes would not reach intended beneficiaries, due to lack of information awareness and accessibility. Hence the Government of India introduced Aadhaar, the first initiative worldwide that provides identity through effective use of biometric technology. The Key feature of Aadhaar is the online authenticable digital cradle-to-grave portable identity. This has led to improved technological services through increased transparency. Clear accountability and transparent monitoring have significantly improved access and quality of services for all citizens.

Citizens who are older and less affluent, quite often tend to have significant issues with health or disability and are also largely disconnected from the world of digital tools and services, both physically and psychologically. Knowledge is power, and speakers of languages other than English face a range of challenges in accessing information. Cultural competency is another important factor. Idioms and word meanings can vary regionally. Field testing and community feedback is the best way to ensure your content is both linguistically

accurate and culturally competent for your target community. While Google Translate might be great for tourists and casual use, the quality of the translation is unreliable, and language access experts generally advise against it. Remote assistance can be especially effective for rural communities, where in-language assistance may more be difficult to come by. Online resources and technology-enabled initiatives will have the most impact when interwoven with offline strategies and involvement from trusted local community partners [3]

The study determines the pattern of usage of digital devices among senior citizens, so that it may open up avenues of research, to identify technologies that will enable seniors to confidently use the digital platform thereby enabling them to age well.

III. AGEING POPULATION – LITERATURE SURVEY

The term ageing of the population refers to a relative increase in the number of aged persons. Studies show that, once seniors join the online world, digital technology often becomes an integral part of their daily lives.Our lives increasingly rely on accessing the internet-mobile phone to perform on-line transactions such as paying bills, booking appointments/tickets. However, people who have the greatest need often lack the basic digital literacy skills and resources to complete online transaction. So it is imperative to identify technologies that will enable seniors to confidently use the digital platform to enhance their lives [4].

KERALA

Among the Indian States, Kerala has the highest proportion of literate persons. The e literacy rate is 93.91 % as per Census 2011. In Kerala, 96.02 % men and 91.98 % of women are literate as against 82.14 % of men and 65.46 % of women at national level.

In the state of Kerala, the 60 plus population was found to be 5.1 % of the total in 1961 and was just below the national 5.6 %. Since 1980, Kerala has overtaken the rest. In 2001 comparatively it is 10.5 % to 7.5 % [5]. Around 13 % of the population is already past 60 years by 2011. According to a study (Centre for Development Studies, 2013 "A survey on ageing scenario in Kerala"), the State's elderly population is growing at a perpetual rate of 2.3 % [6]. Among the elderly aged 70 or 80 and above the growth rate is high. Currently 42 lakh people of Kerala are above 60 years and 13 % of them are 80 years and above, the fastest growing group among the old.

ELDERLY & TECHNOLOGY

Digital technology can support senior citizens in performing their day to day tasks and promote ageing gracefully. The mobile phones, television, security systems and other communication devices are now becoming more integrated with computer network resources as they provide faster and more powerful interactive services. To function independently and successfully tackle their environment, people of all ages need to interact with some form of technology [7].

There seems to be a discrepancy between digital technologies that are developed and what older adults require. The inclusion of older adults in the design process and research of digital technology is essential if technology is to fulfil the promise of improved well-being. Programmers and research scholars must make every effort to ensure the involvement of older adults in the design process of digital technology. For this an assessment of their current level of usage needs to be recorded and their problems with current technology usage must be identified [8].

Disparity in technology access was found between the English-speaking population and natives of indigenous languages. Poor provision of information and communication technologies in low/middle-income countries represents a concern for effective use of new technologies. A lot of linguistic and cultural hurdles are experienced by users whose first language is not English. Linguistic and social choices have already been suggested as elements that shape how corporations and governments make strategic choices about website developments, thus transforming access and use [9].

The elderly are called upon to adapt to digital technology and the demands of modern digital era. It is widely accepted that elder individuals find it difficult to adapt to the advent of new technologies when compared to younger generations. Furthermore, in their efforts to embrace new technologies, they usually face many difficulties deriving from demographic and linguistic characteristics as well as difficulties related to the complexity of new technology. Thus, by understanding the difficulties that the elderly experience, researchers can attempt to significantly contribute to the improvement of their quality of life by suggesting alternatives [10].

IV. SCOPE OF THE WORK

The study aims at identifying the requirements and usage of digital devices among senior citizens with reference to Kerala.

EMPHASIS ON KERALA

Kerala is ageing fastest among the states of India. The move in the age composition in favour of old age has implications on Kerala's socio-economic situation. In traditional Indian culture and joint family arrangements, the extended family provided adequate social and financial security. However, this has almost eroded with the emergent nuclear family with very poor arrangements for taking care of the elderly. As Kerala has a large Non-Resident Indian population, with the youth leaving the country for greener pastures abroad, the elderly are left alone without much family support.

Dependency ratio is defined as the ratio of the dependent population to that of the working age population and is an important indicator of the economic burden carried by each worker. The ratio of persons aged 60 years and above to the working age population is defined as Old age dependency. The 'Old' Dependency Ratio of India as per 2011 census is 142 and in Kerala it is 196 due to higher life expectancy at birth [6].

SOCIAL CAUSE

Indian Government's Role in Welfare of Aged

The Government of India has been committed to supporting the elderly in our society with certain welfare methods. The Government of India has approved the National Policy for Older Persons on January 13, 1999 to step up welfare measures for aging well [11].

Schemes of the Kerala State for elderly

Kerala was one of the earliest States to introduce a policy for senior citizens. The first policy document emerged in 2006. The Old Age Policy of 2006 has been bettered as the State Old Age Policy 2013. The aim of the policy is to ensure maximum welfare facilities to all aged people in the State [11].

Age Friendly Panchayat: - The objective of this programme is to transform all the Panchayats in the State into age-friendly Panchayats thereby ensuring good health, social participation, and a better quality of life for Senior Citizens.

Vayomithram: - For the elderly above the age of 65 years residing at Corporation/Municipal Areas, Kerala Social Security Mission implements the Vayomithram project which provides them health care and support.

Vayo Amrutham: - Under this scheme, Ayurvedic treatment is provided to the Inmates inmates belonging to all the government old age homes functioning under Social Justice Department.

Mandahasam: - is an initiative by the Social Justice Department that delivers free dental care for the senior citizens.

Sayamprabha:- Home project is a new initiative of the Social Justice Department that provides day care facilities for elders.

KERALA E-STATISTICS

Kerala has emerged as the state with the highest smartphone penetration in the country, according to the data released by CyberMedia Research, a market intelligence firm tracking the technology sector [12].

CMR's data also reveals that on a pan-India level, about 47% of the mobile phone users in India are on smartphones, with the remaining 53% still on feature phones. Kerala led the charts with a penetration of 65%, followed by Gujarat at close to 60% and Punjab at about 59%.

Kerala has the highest mobile penetration with a rapid increase in the usage of smart phones. It also has high Internet penetration. Kerala is among the top five states if tele density is concerned (95.70 persons with telephone connections for every 100 individuals). The other e-statistics are as follows: 34.71 Internet subscriptions per 100 population, 12.31 million Internet subscriptions, 2.68 million wireline subscriber base of which 65 per cent is rural and 31.13 million wireless subscribers [13].

This study used the triangulation approach of both qualitative and quantitative methods. A survey was used to collect quantitative data from media users. Structured interviews were conducted with newspaper editors to collect qualitative data which provided detailed information on the current situation of newspapers in the face of digital platforms. Interviews allowed the researcher to gather in-depth data that questionnaires could not produce. The research population was the entire Namibian newspaper industry. The sample for this study was made up of editors from each of the two newspapers, The Namibian and New Era which were selected purposively using non-probability sampling techniques. Stratified random sampling was used to distribute 60 questionnaires to Windhoek residents of which 53 were answered and returned. Both qualitative and quantitative data analysis methods were used, content analysis was used to analyze the interviews and statistical tests in SPSS were used to analyse the survey data.

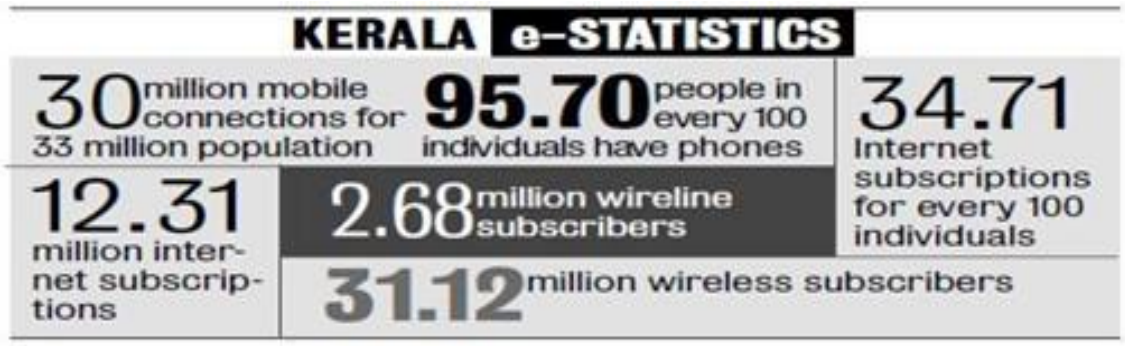

Fig1 -Kerala e-Statistics

In Kerala 20% of households have Internet penetration through broadband and 15% of households access the Internet through mobile phones. Kerala is also the first state to complete the National Optic Fibre Network Project, by providing high-speed Internet to all gram panchayats and remote areas.Malappuram became India's first fully e-literate district over a decade ago. "This region arguably buys the most number of smart gadgets in Kerala, thanks to the remittances from West Asia," explains Muneer Valappil, who teaches communication and journalism at EMEA College Kondotty [14].

Free digital devices for the economically weaker to access e-governance services is one of the highlights of the Kerala's IT policy. The policy envisage steps for scaling up digital services not only in governance but also in areas affecting the daily life as well as in commercial sectors. Promoting Internet of Things, a green protocol for e-waste, giving priority to free and Open Source Software and digital tendering process are other components of the policy [15].

V. RESEARCH METHODOLOGY AND FINDINGS

Sampling: The data was collected from selected citizens in Kerala. The researcher collected 75 samples through simple random sampling technique for the study.

Tools for data collection: A questionnaire consisting of 18 objective type questions and 2 open ended questions was used. Data was collected and analysed extensively using R Statistical software.

Period of Study: The reference period was from Jan 2020 to March 2020.

Age: Age wise distribution of respondents was as follows: 50% of the respondents belong to 60 to 80 age group, 34% of the respondents belongs to 40 to 60 years, remaining 16% of the respondents were more than 80 years old.

Education: 37% of the respondents had studied up to the Undergraduate level, 37% till PUC/12, 20% were below secondary school level, 3% finished diploma and 3% were post graduate.

According to the study, 95% of the elderly current own a mobile phone.

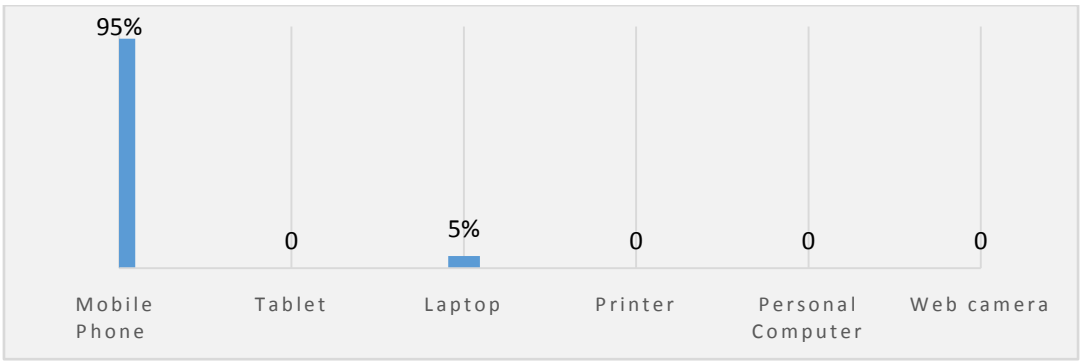

Fig2 Digital devices currently owned

71% preferred traditional mode of transactions.

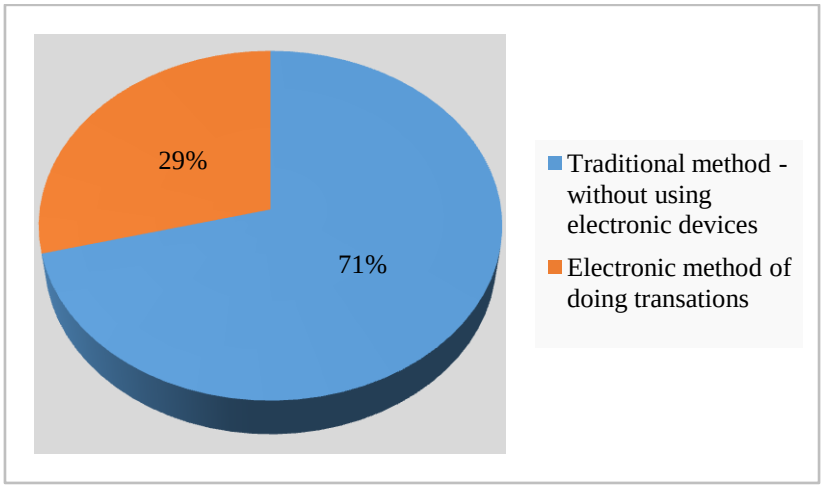

Fig3 Preferred mode of transaction

The most common digital service used by most of the senior citizens was ATM transactions. It accounted for 55% of all digital services.

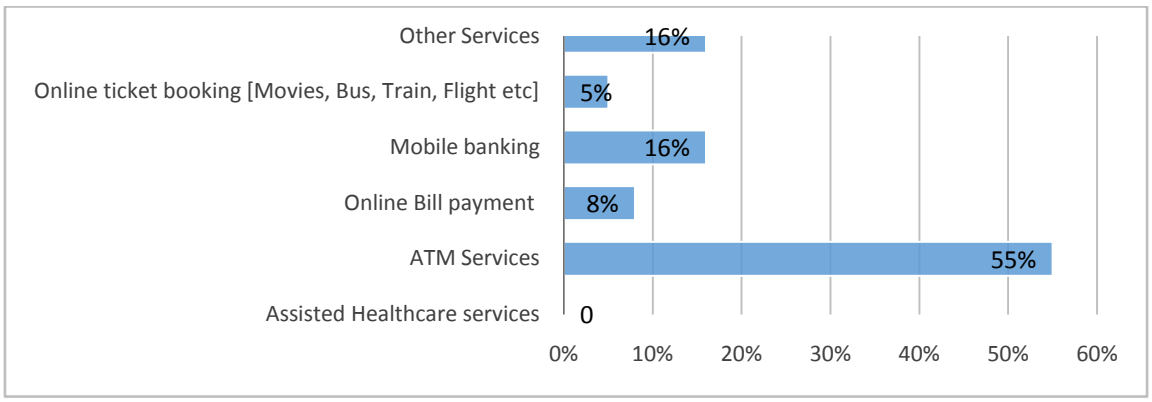

Fig4 digital services preferred

25% of the elderly are always willing to learn and 55% of the elderly are willing to learn new technologies if needed.

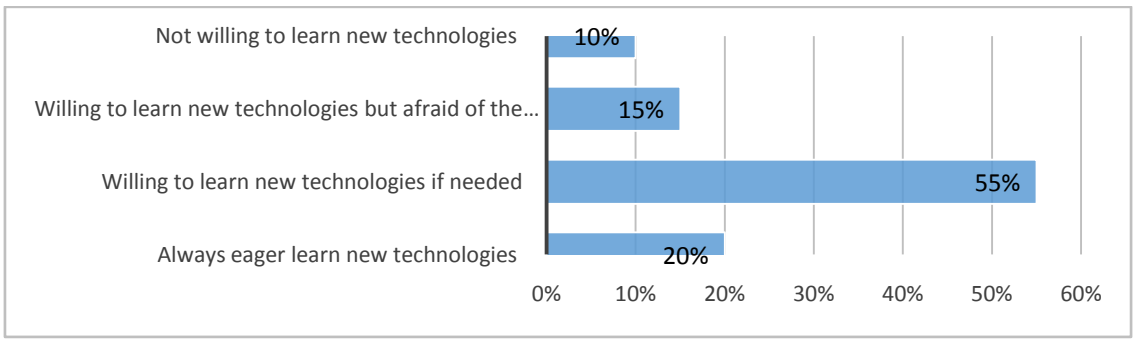

Fig5 willingness to learn new technologies

The study found that 90% of the respondents had no idea about the Government schemes and services offered through digital mode.

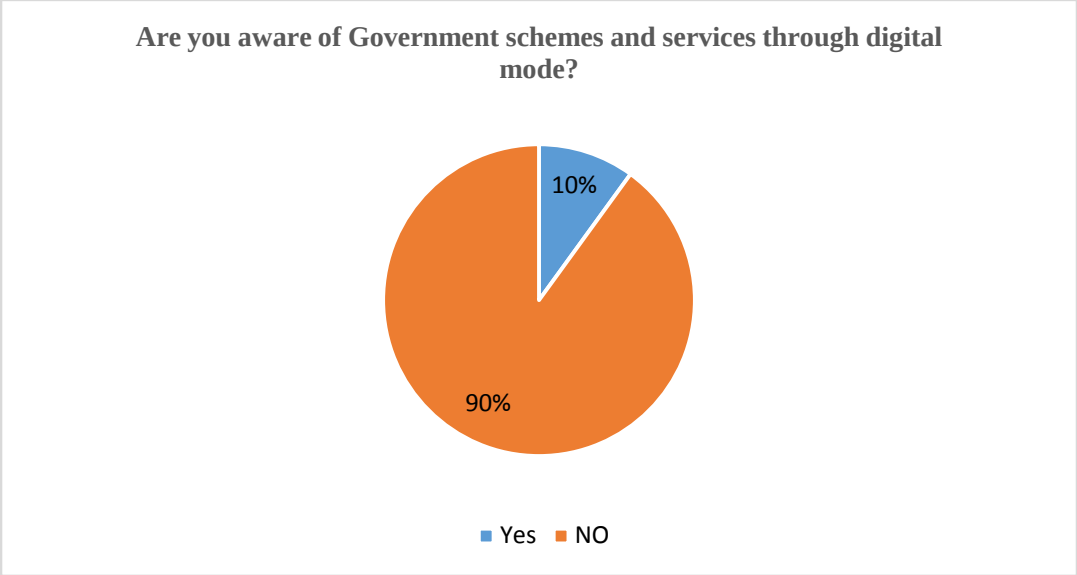

Fig6 Awareness of Government Schemes

It was found that 90% of the senior citizens had sought help to use electronic devices and services and 71% elderly are in favour of Digital India, though they lack awareness of the complete benefits.

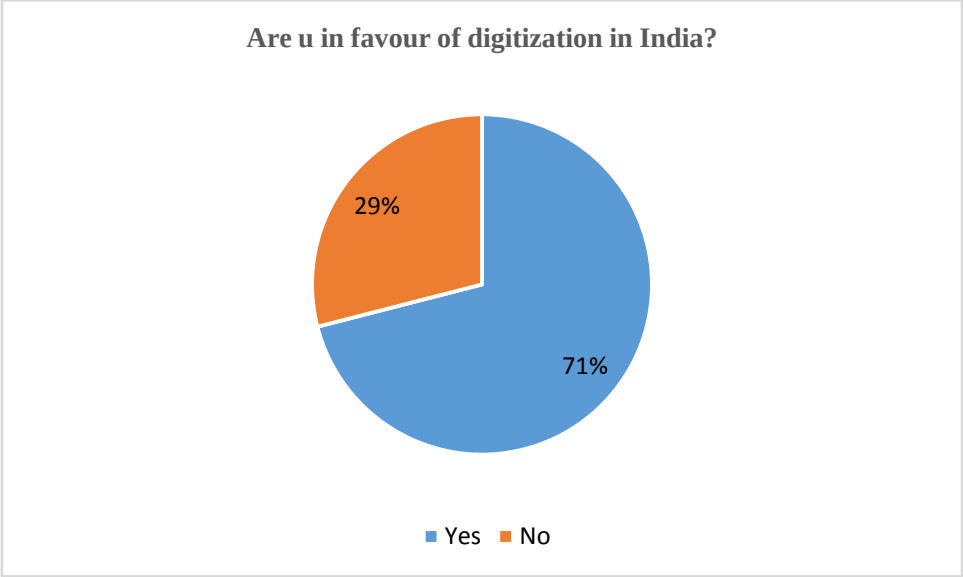

Fig7 Digitization in India

While most of senior citizens are keen to use smartphones, computers, laptops, and other modern gadgets, they seldom get support from family members, relatives, or society due to the latter's hectic lifestyle among other factors. Despite enormous benefits of digital device usage available for senior citizens on one side, they find it difficult to use the devices on the other. Also, there is a keen desire among the elderly to get connected with the outside world and to learn new technologies. The study suggests that the ease of use of technological devices allows the elderly to a lead a better social life in the modern digital era.

VI. CONCLUSION

Kerala state has the highest proportion of literate persons. The study shows that senior citizens are willing to learn new technologies and they accept digitization. It also shows they are not aware of beneficial schemes provided by government. So, this study paves way for research and study regarding digital devices possessed by senior citizens and access to digital devices. Thus, digital divide can be reduced among the citizens. Along with that ease of use of digital devices should be given priority so that elderly can use them for their benefits.

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A STUDY ON THE INFLUENCE OF WEBSITE QUALITY OF MOBILE FOOD ORDERING APPS (MFOA) ON CUSTOMER SATISFACTION

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A STUDY ON THE INFLUENCE OF WEBSITE QUALITY OF MOBILE FOOD ORDERING APPS (MFOA) ON CUSTOMER SATISFACTION

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ABSTRACT

Statistics reveal that the food tech industry though at a nascent stage is poised to grow in leaps & bounds. Numerous factors contribute to this phenomenon of which, rising internet penetration and accessibility, favorable consumer disposition, expanding network of restaurants on food tech platforms, increasing social acceptance etc. are the primary drivers. The purpose of this study is to focus on how the website quality influences customer satisfaction while using food apps. For this, SEM was employed to test the model and the hypothesis. The findings from Pearson Correlation indicate that there is a positive significant influence of website quality on customer satisfaction. Further this study attempts to assess the level of customer satisfaction in food apps while ordering food using MFOA. Besides, a sneak peek on the level of customer satisfaction discloses that the satisfaction level among the users is good.

Keywords: Mobile food ordering apps (MFOA), Website Quality, Customer Satisfaction.

1. INTRODUCTION

A slew of online food delivery players have through partnerships been building scale by zeroing in strategies that can offer a veritable buffet to its customers, thus leaving the organized food business a robust growth potential and a promising future. IBEF report states that the online food delivery industry is growing at 150 percent year on year. The article by Sarvant Singh in Forbes revealed that the online food delivery is estimated to reach $200 Billion by 2025 stand testament to this growth strategy. As per the BCG report there is a burgeoning increase of online buyers specifically due to multiple factors like growing internet penetration, strong value proposition offered by online merchants, proliferating payment platforms, and rising e- commerce adoption.

The internet based electronic commerce environment enables consumers' to purchase products & services through online mode. With the advent of technology, people are more prone to use apps for availing products & services. From paying bills to buying groceries, people started depending more on mobile apps. The growth in discretionary income coupled with shortage of time due to new lifestyle paved the way for the quick acceptance of mobile food ordering apps. Thus MFOAs gained popularity especially among youngsters, who could leverage technology to their advantage of doing business via the internet. Moreover MFOA provides the luxury of dining at the comfort of one's home, the cuisine which one selects based on one's preference. In contrast to brick and mortar stores the online platform has additional attributes like the navigation which solely depends on the user interface. A well designed user interface system will help the consumers in searching out their preferred choice, spending less time and more convenient. This study gives insight to the food delivery players to identify the level of customer satisfaction while using the food apps and how to make each interaction enjoyable.

2. REVIEW OF LITERATURE

Review of literature reveals that there are hardly a few studies focusing on the influence of website quality of food delivery apps and its effects on customer satisfaction.

Mobile Food Ordering Apps

As indicated by Sethu and Saini (2016), The online food requesting applications were broken down by the scientist based on specific qualities. A Large part of the buyers knew about buying on the web and found that it is exceptionally advantageous to utilize the web.

Boyer and Hult (2005) said that the Behavioral Scoring Model which says that the organizations examines the criticism overviews of the clients, considers their buying conduct and designs and anticipates the future buying practices of the clients. This exploration model involves barely any components which causes the organization to accomplish great outcomes.

As indicated by G. See-Kwong (2017), The food conveyance framework in India has been developing at a bigger pace because of innovation. From making orders accessible as need to be requesting on the web and fulfilling all the necessities of the clients and making changes as per the changing needs of the clients. Presently everything can be conveyed to the clients at their doorstep.

As per Adithya R., Singh, Pathan and Kanade (2017), A food menu is set in the online food requesting framework so the clients can put in their requests effectively and with this they can likewise follow their requests. Additionally, different offices are likewise given by these applications to making its entrance helpful for the clients.

Donkoh and Quainoo (2012) expressed that the Customers' discernments about food and administrations are significant for the food and administration industry since it encourages them to recognize the necessities and inclinations of the clients and fulfill them. In this investigation the impressions of the client were decided on different components.

Darn and Tran (2018) said that the Internet has assumed a significant job in expanding the familiarity with the online food conveyance applications. Through the web, individuals can look about nourishments and cafés, think about their costs and their administrations and have simple access to them. Web has made every one of these things helpful for the clients.

Kanteti (2018) expressed that Startups have become the innovators in India and are administering the economy since recent years. These organizations are begun by technically knowledgeable youthful people. These youthful people having new minds and mew and imaginative thoughts begins various types of organizations with the assistance of innovation.

As indicated by Hossain (2000), With the adjustments in mentality of the shoppers, innovation and socioeconomics in our general public, there should be changes in food conveyance frameworks so as to work well for the clients. Yang Fan (2014) expressed that Web App and Android Apps have been created lately after the improvement of data innovation. As contrasted with the work area App, the upsides of web App are that there is no need of refreshing or establishment and programs can be effortlessly visited. The upsides of android App are the advancement of an amazing system, comfort, wide commercial center for application dispersion.

Leong Wai Hong (2016) expressed that People have dealt with their errand effectively and productively due to mechanical progressions. The board framework helps in diminishing human labor tasks, helps in decreasing the time, and further aides in creating reports for the board reason by completely using the framework.

Customer Loyalty

Chaudhuri and Holbrook (2001) and Hsin and Hsin (2011) referenced that there are two sorts of unwaveringness: attitudinal dependability and social devotion. Attitudinal dependability shows long term mental duty of a customer to a store or organization (Caruana 2002; Shankar et al. 2003; Hsin and Hsin 2011). Attitudinal reliability can be seen from the mental contribution, partiality, and a feeling of altruism on specific items (Chang et al. 2009).

The Antecedents of Online Customer Satisfaction

Liu et al. (2008) define the predecessors of buyer satisfaction dependent on the phases of the web based buying process: data search and assessment of options, buying, and post-buy stage. At the data search and assessment of options stage there are data quality, web composition and product properties. While at the buying stage there are exchange capacity, responsiveness, security/protection, and instalment. In the post purchase stage, Liu et al. (2008) included conveyance and client assistance. Those precursors may affect consumer loyalty online stores.

Customer Satisfaction

Satisfaction is a passionate or psychological reaction to a center (desires, item, utilization experience, and so forth.), at once (after utilization, after the vote, the aggregation of experience, and so on.). Satisfaction is a post-buy wonder. Satisfaction was estimated uniquely during the assessment procedure (Giese and Cote 2002).Westbrook and Reilly (1983), cited in Giese and Cote (2002) uncovered that satisfaction is an enthusiastic reaction to the involvement in the item (or administration) that have been bought, retail outlets, or even examples of conduct, for example, shopping and purchasing conduct. Enthusiastic reaction was gone before by an intellectual assessment procedure, observation (or conviction) of an article, activity, or condition, contrasted with the estimation of the individual (or the necessities and needs).

Website quality

As indicated by Wang et al. (2010), the plan of the site is related with buyer view of the association and request at the site. The stylish measurement, specifically, is identified with buyer impression of the presence of the site. Online buyers with various inspirations will react to the web architecture in various manners just as purchaser inspiration influences the data preparing examples and feelings. Manes (1997) in Liu et al. (2008) and Szymanski and Hise (2000) states that the great site has a decent association, so customers will be anything but difficult to locate the ideal data about the item. Great web architecture is a slick screen appearance, make data way, and snappy data stacking. Those components will make a great looking buyer and may impact consumer loyalty. Liu et al. (2008) referenced the product characteristics at the phase of data search and assessment of options. As per Szymanski and Hise (2000), stock qualities are characterized as elements identified with the proposal for online deal which is excluded from the web composition and shopping accommodation. In particular, the properties are characterized as product assortment and quality items that mirror a specific cost. The lower expenses of data chasing and the more item varieties, it will be more appealing to shoppers, since customers may get more data and pick an assortment of items in a single spot. Strauss and Frost

(2009) states that web based shopping in one online store will spare the time. Wide assortment of items, the impression of unrivaled items, and the view of low costs will positively affect consumer loyalty.

3. RESEARCH METHODOLOGY

Descriptive research design is used in this study and a pilot study was conducted to have reliability check on the questionnaire used. The target population included the customers who have purchased food by ordering through a mobile food ordering app in Ernakulam district. The study was conducted during the pandemic period, and had limitations for collecting data due to lock down regulations. Hence Snowball sampling was used and the questionnaire was administered by Google sheets. The survey instrument was developed by the researcher after an extensive review of literature based on which sufficient constructs were framed to elicit information regarding the two variables used. A five point Likert scale was administered to collect information, of which 5 indicating strong agreement and 1 indicating strong disagreement and 3 indicating neutrality.

4. DATA ANALYSIS

The result of frequency analysis used to examine the quality of the respondents is shown in table 1. The ratio of male and female is 37 % and 63 % respectively. There is variation in the age group as the majority (66%) of the respondents belong to the below 25 years age group and the majority are postgraduate students. It can also be understood that the major portion of the respondents reside in urban and semi urban areas where as a minor percentage represents that of rural areas.

Table 1: Characteristics of participants in the study

Demographics	Group	Frequency	Percentage
Gender	Male	74	37.0
	Female	126	63.0
Age	below 25	132	66.0
	25 and above	68	34.0
Education	High School	2	1.0
	Graduate	66	33.0
	Post Graduate	126	63.0
	Ph.D	6	3.0
Occupation	Wage Earners	3	1.5
	IT Industry/Financial Industry	2	1.0
	Self Employed	7	3.5
	Govt. employed	6	3.0
	Student	182	91.0
Annual Household Income	Below 1,50,000	91	45.5
	1,50,001- 4,00,000	45	22.5
	4,00,001- 6,00,000	32	16.0
	Above 6,00,000	32	16.0
Area	Urban	87	43.5
	Semi Urban	76	38.0
	Rural	37	18.5
	Total	200	100.0

Source: Computed from data

4.1 Influence of demographic characteristics on Customer Satisfaction of Food App

The study has been aimed to get deeper insight on the influence of demographic characteristics on customer satisfaction.

Ho: Demographic characteristics do not have an influence on customer satisfaction.

One way ANOVA with multiple comparison tests, is carried out to analyse whether the variables considered significantly varied with the demographics of the respondents and the results are exhibited in table 2.

The test was performed to ascertain whether a significant difference in customer satisfaction existed between the respondents based on the demographic characteristics like gender, age, education, occupation, annual household income and area.

Table 2: Means, Standard Deviation and F value for Customer satisfaction

Demographic	Group	N	Mean	Std. Deviation	Z/F	P value
Gender	Male	74	34.34	10.07	-0.470	0.639
	Female	126	34.98	8.98		
Age	below 25	132	35.38	8.94	1.334	0.184
	25 and above	68	33.51	10.14		
Education	High School	2	35.00	0.00	0.124	0.946
	Graduate	66	35.32	8.94		
	Post Graduate	126	34.46	9.85		
	Ph.D	6	34.33	5.39		
Occupation	Wage Earners	3	44.00	0.00	2.157	0.075
	IT Industry/Financial Industry	2	46.00	0.00		
	Self Employed	7	29.00	13.10		
	Govt. employed	6	34.67	5.82		
	Student	182	34.69	9.27		
Annual Household Income	Below 1,50,000	91	35.34	9.40	2.343	0.074
	1,50,001- 4,00,000	45	35.53	8.95		
	4,00,001- 6,00,000	32	30.78	9.91		
	Above 6,00,000	32	35.91	8.75		
Area	Urban	87	34.40	11.14	5.809	0.004
	Semi Urban	76	37.04	6.39		
	Rural	37	30.84	8.81		

Source:

From the ANOVA, It is observed that all the demographic factors except the demographic variable, area are found to be insignificant ($p>0.05$). Even if there are variations in mean scores between the different categories in each of the demographic factors, the test result reveals there is no difference between them with respect to customer satisfaction. However, it can be concluded that customer satisfaction varies within the area as the p value is 0.004. Hence the Multiple comparison test, (post- hoc) was done to ascertain which of the group (area) means were significantly different from others at significance level, $p<0.05$. The results of the post hoc comparison test are detailed in table 3.

The result indicated that the rural area significantly differed from urban & semi urban areas. However, no such difference existed between semi urban & urban areas.

Table 3: Multiple Comparison Test

(I) Area		Mean Difference (I-J)	Std. Error	Sig.
Urban	Semi Urban	-2.63717	1.43845	.068
	Rural	3.56446*	1.79811	.049
Semi Urban	Urban	2.63717	1.43845	.068
	Rural	6.20164*	1.83653	.001
Rural	Urban	-3.56446*	1.79811	.049
	Semi Urban	-6.20164*	1.83653	.001

4.2 To study the relationship between website quality and customer satisfaction

The main objective of this study is to find out the relationship between Website Quality and Customer Satisfaction.

4.2.1 To study the relevant parameters that influence the website quality of food apps while using MFOA

To study this objective the measurement model is first obtained using CFA, which is indicated in Table 4.

The hypotheses that are to be proved are:

Ho: Construct WQ1 to WQ 13 have no impact on WQ.

H1: Construct WQ 1 to WQ 13 have significant impact on WQ.

Table 4: Model fit Indices for CFA- WQ's

	χ^2	DF	P	Normed χ2	GFI	AGFI	NFI	TLI	CFI	RMR	RMSEA
Website quality	70.465	40	.002	1.762	.948	.881	.977	.980	.990	.031	.062

All the attributes were loaded significantly on the latent constructs. The value of the fit indices indicates a reasonable fit of the measurement model with data.

The validity of the hypotheses was assessed by examining the regression coefficients of extracted constructs. The results of the path coefficients' analysis confirmed that the entire factors have an influence on Website Quality as the value (standard regression weights) was found greater than 0.4. All the attributes loaded significantly on the latent constructs. The value of the fit indices indicates a reasonable fit of the measurement model with the data. In short the measurement model confirms the factor structure of the constructs.

The result of the regression coefficients is presented in Table 5.

Table 5: Standardized Regression Weights (Factor Loading)

Path	Estimate	Critical Ratio (CR)	P	Variance explained	Rank
WQ1 → Website quality	0.837	16.998	<0.001	70.0	6
WQ2 → Website quality	0.851	17.682	<0.001	72.4	4
WQ3 → Website quality	0.831	16.722	<0.001	69.1	9
WQ4 → Website quality	0.738	13.279	<0.001	54.5	13
WQ5 → Website quality	0.835	16.905	<0.001	69.8	7
WQ6 → Website quality	0.774	14.460	<0.001	59.9	11
WQ7 → Website quality	0.816	16.067	<0.001	66.7	10
WQ8 → Website quality	0.834	16.859	<0.001	69.5	8
WQ9 → Website quality	0.844	17.333	<0.001	71.2	5
WQ10 → Website quality	0.928	23.072	<0.001	86.1	2
WQ11 → Website quality	0.933	23.595	<0.001	87.1	1
WQ12 → Website quality	0.761	14.016	<0.001	58.0	12
WQ13 → Website quality	0.911	21.522	<0.001	83.0	3

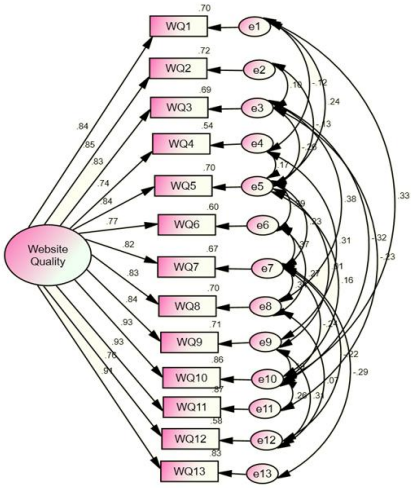

Figure 1: Measurement Model of Website Quality

From the above table it is observed that all constructs have the regression coefficient value greater than 0.4. Thus it can be inferred that all the constructs considered have significant influence on website quality. Moreover it is understood that usage of the app is the most influencing factor followed by credibility of the app and delivery assurance. Feeling of privacy along with the customer's confidence that the app will provide error free delivery stands as the next important factor when considering the quality of the website. The factors associated with the design of the app like its user friendliness, features, and the hyperlinks used, payment security, information, content, variety offerings and finally error free transactions are found to be the order of importance affecting the website quality.

4.2.2 To study the relevant parameters that influence the customer satisfaction of food apps while using MFOA

To study the above objective the constructs that influenced the customer satisfaction were also assessed by using SEM. The measurement model was obtained for the variable customer satisfaction as exhibited in table 6. The hypotheses that are to be proved are:

Ho: Construct CS1 to CS 10 has no significant impact on Customer satisfaction.

H1: Construct CS1 to CS 10 has a significant impact on Customer satisfaction.

Table 6: Model fit Indices for CFA-Customer satisfaction

	χ^2	DF	P	Normed χ2	GFI	AGFI	NFI	TLI	CFI	RMR	RMSEA
Consumer satisfaction	33.788	27	.172	1.251	.970	.938	.981	.994	.996	.032	.036

All the attributes loaded significantly on the latent constructs. The value of the fit indices indicates a reasonable fit of the measurement model with data. The validity of the hypotheses was assessed by examining the regression coefficients of extracted constructs. In this case the entire constructs have value greater than 0.4 and hence it can be concluded that all factors considered have significant influence on the variable customer satisfaction.

Table 7: The regression Coefficients

Path	Estimate	Critical Ratio (CR)	P	Variance explained	Rank
CS1 → Consumer satisfaction	0.895	21.842	<0.001	80.1	1
CS2 → Consumer satisfaction	0.883	20.977	<0.001	78.0	3
CS3 → Consumer satisfaction	0.874	20.381	<0.001	76.4	4
CS4 → Consumer satisfaction	0.824	17.654	<0.001	67.8	5
CS5 → Consumer satisfaction	0.791	16.219	<0.001	62.6	6
CS6 → Consumer satisfaction	0.759	15.007	<0.001	57.6	7
CS7 → Consumer satisfaction	0.895	21.842	<0.001	80.1	2
CS8 → Consumer satisfaction	0.713	13.488	<0.001	50.8	9
CS9 → Consumer satisfaction	0.751	14.726	<0.001	56.4	8
CS10 → Consumer satisfaction	0.685	12.661	<0.001	47.0	10

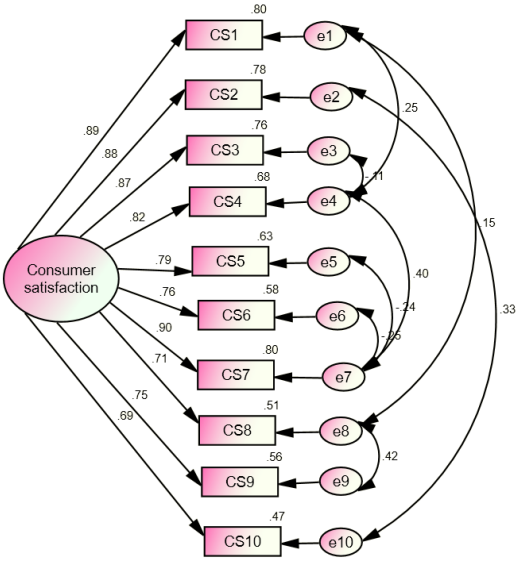

Figure 2: Measurement model of Customer satisfaction

From the regression coefficients value obtained in Table 7, it can be inferred that the variety options, the propensity to continue to use the food app, the good experiences, ease in transactions, service quality, speed of delivery, discounts offered are in the order of importance which affected the customer satisfaction of food app. Furthermore, the delight in using the food app, timely redressal of complaints (addressing the complaints) & the overall service satisfaction also found relevant in the influence of customer satisfaction of the food apps.

4.2.3 In order to assess the relationship between website quality and customer satisfaction the following hypothesis was generated

Ho: there is no relationship between website quality and customer satisfaction

The Pearson Correlation is deemed to be adequate to analyze the relationship between the two variables which were interval-scaled and ratio-scaled. Furthermore, correlation coefficients reveal magnitude and direction of relationships which are suitable for hypothesis testing and the results are exhibited in Table 8.

Table 8: The Pearson Correlation between Website Quality and Customer satisfaction

Variables	Correlation	Lower bound	Upper bound	Z	p
Website quality and consumer satisfaction	0.791	0.773	0.809	18.192	<0.001

In the above table the correlation between website Quality and Customer satisfaction is .791, which is above .50 and the p value is less than .05 hence found to be significant. Thus we reject the Null hypothesis. i.e. the correlation value denotes a significant positive relationship between these two variables. As there exists a positive relationship, the next step is to evaluate the mathematical relationship between these variables using SEM.

The following tables reveals the model fit indices and the regression coefficient for the relationship between Website Quality and Customer satisfaction

Table 9: Model fit Indices for CFA for Website Quality and Customer satisfaction

Variables	χ^2	DF	P	Normed χ2	GFI	AGFI	NFI	TLI	CFI	RMR	RMSEA
Website Quality-Customer satisfaction	.000	0	.000	0	1.000	.000	1.000	.000	1.000	.000	.988

All the attributes loaded significantly on the latent constructs. The value of the fit indices indicates a reasonable fit of the measurement model with data. The Goodness of Fit Index (GFI) value (1.00) is greater than 0.9 which represents it is a good fit. The calculated Normed Fit Index value (1.00) and Comparative Fit Index value is 1.000 further indicates that the model is a perfect fit model. The regression coefficients are presented in Table 10.

Table 10: The regression coefficients of Website Quality and Customer satisfaction

Path	Estimate	Critical Ratio (CR)	P	Variance explained
Website quality → Customer satisfaction	1.361	13.179	<0.001	30.1
WQ1 → Website quality	0.837	16.998	<0.001	70.0
WQ2 → Website quality	0.851	17.682	<0.001	72.4
WQ3 → Website quality	0.831	16.722	<0.001	69.1
WQ4 → Website quality	0.738	13.279	<0.001	54.5
WQ5 → Website quality	0.835	16.905	<0.001	69.8
WQ6 → Website quality	0.774	14.46	<0.001	59.9
WQ7 → Website quality	0.816	16.067	<0.001	66.7
WQ8 → Website quality	0.834	16.859	<0.001	69.5
WQ9 → Website quality	0.844	17.333	<0.001	71.2
WQ10 → Website quality	0.928	23.072	<0.001	86.1
WQ11 → Website quality	0.933	23.595	<0.001	87.1
WQ12 → Website quality	0.761	14.016	<0.001	58.0
WQ13 → Website quality	0.911	21.522	<0.001	83.0
CS1 → Customer satisfaction	0.895	21.842	<0.001	80.1
CS2 → Customer satisfaction	0.883	20.977	<0.001	78.0
CS3 → Customer satisfaction	0.874	20.381	<0.001	76.4
CS4 → Customer satisfaction	0.824	17.654	<0.001	67.8
CS5 → Customer satisfaction	0.791	16.219	<0.001	62.6
CS6 → Customer satisfaction	0.759	15.007	<0.001	57.6
CS7 → Customer satisfaction	0.895	21.842	<0.001	80.1
CS8 → Customer satisfaction	0.713	13.488	<0.001	50.8
CS9 → Customer satisfaction	0.751	14.726	<0.001	56.4
CS10 → Customer satisfaction	0.685	12.661	<0.001	47.0

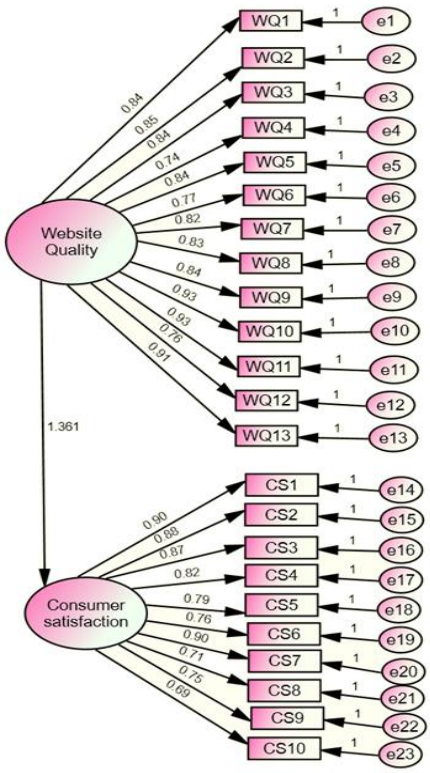

Figure 3: SEM of Website Quality on Customer Satisfaction

Here the relation between Website Quality and customer satisfaction is 1.361 which means there exists a perfect relation between them. The website quality is strongly associated with customer satisfaction. This signifies that the higher the quality of the website of food apps the more will be the satisfaction of customers.

4.3 To assess the level of customer satisfaction in MFOA usage

With this objective, the respondents were asked 10 questions on a five point Likert scale. The responses are scored as 1 for 'Strongly Disagree', 2 for 'Disagree', 3 for Uncertain', 4 for 'Agree' and 5 for 'Strongly Agree'. The total score of the 5 questions for all 200 respondents is found out, based on which we calculate the mean % score of level of consumer satisfaction $\left[MPS = \frac{MeanScore \times 100}{Maximumpossiblescore}\right]\left[MPS = \frac{MeanScore \times 100}{Maximumpossiblescore}\right]$.

This score is classified into one of the four groups as low if the mean % score is less than 35%, average, if the mean % score is between 35 to 50 per cent, good if the mean % score lies in the interval 50 to 75% and excellent in case if the mean % score is above 75%.

A one sample Z test is carried out to test the significance. The table 11, gives the Mean, SD, Mean % Score and Z value of the variable considered. (Loyd et al.,1985)

To test whether the sample information that we observe exists in the population or to verify that the level of consumer satisfaction with regard to Website Quality, the following hypothesis was formulated.

H_0: The level of consumer satisfaction with regard to the Website Quality is excellent

H_1: The level of consumer satisfaction with regard to the Website Quality is good

Table 11: Mean, Standard deviation and z value for consumer satisfaction

Variable	N	Mean	Standard Deviation	Mean % score	CV	z	p value
Consumer satisfaction	200	34.75	9.38	69.49	27.00	-4.154	<0.001

To test the above hypothesis one sample Z test was done and the result is exhibited in Table 11. From the table the p value is less than 0.05 and Z value is negative, which indicates that the test is significant. The mean percentage score level of consumer satisfaction with regard to the Website Quality is 69.49% which indicates that the level of consumer satisfaction is good. Hence the null hypothesis is rejected leading to the conclusion that the level of consumer satisfaction with regard to the Website Quality is good.

The coefficient of variation, CV= $\frac{\text{Standard deviation}*100}{\text{Mean}}$ indicates that this score is stable as the value is greater than 20%.

5. LIMITATIONS

Regardless of the effort to enrich the current understanding of MFOAs, there are some limitations on this paper, which provides opportunities for future research. Chances are that certain factors might have been omitted. As this study was conducted during the lockdown period the data was collected online which was indeed a limitation.

6. MANAGERIAL IMPLICATION OR RELEVANCE OF THIS STUDY

Since March 2020, the whole world is fighting against Pandemic and there are a lot of restrictions imposed on human life to safeguard against the dreadful disease. The new normal has altered the workplace, lifestyle and restrictions continue as lockdown and containment zone, which makes travelling impossible. People are adapting/ attuning to the change by leveraging technology and transforming to online mode. As per the restrictions imposed on dining out along with the availability of MFOAs make this industry highly competitive. In this context the Mobile Food Ordering Apps face tough competition to stay ahead and to satisfy the customers in terms of the features or characteristics of the website design. This makes this study all the more relevant than ever before.

7. CONCLUSION

This study has attempted to provide insights on the influence of the quality of websites that could shape the customer satisfaction in food apps while ordering food using MFOAs. The results of the Pearson correlation brought in the fact that there is a strong positive influence of website quality on customer satisfaction. Finally the study concluded by assessing the level of customer satisfaction which was observed to be good while using MFOA. Hence both the outcomes of this study give new dimension to marketers to evolve suitable strategies to improve the customer satisfaction and to make their Mobile food ordering app further appealing and user friendly. Nevertheless, it enables MFOA companies to identify those factors that give customers more weightage while assessing the quality of website and hence they can think of a radical change which can help them in wooing the customers to use mobile food ordering apps.

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Sectoral Correlations and Interlinkages: NSE

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Abstract

An efficient portfolio is a well-diversified portfolio that gives the investor opportunities to earn money and provide cover against risks. Understanding the intersectoral linkages and correlations among various sectors in a stock market will help an investor to diversify the portfolio and reduce risk efficiently. This study aims at examining the underlying linkages and correlations among eight sectors in the Indian National Stock Exchange (NSE) using a Granger causality test under VAR environment. The results of the study based on nine years' data from 2009 to 2018 show that an effective portfolio can have two classifications –stocks from Pharma and Media as group one (defensive stocks) and picks from IT, Bank, Financial Services, Realty, Auto and FMCG sector as group two (somewhat Cyclical). The study further proves that the usual definition for cyclical and defensive sectors have undergone some profound changes.

Keywords: *Portfolio Diversification, intersectoral linkages, ADF Test, Granger causality.*

The investment pattern is changing from one generation to another as a result of an increase in risk-taking appetite of different generations. It was plots and land for our forefathers who were risk-averse investors, it became bank FD's, postal deposits and chit funds etc. for baby boomers who were born after the 1950's, and it is stock markets for the Millennials, born after 1980. The fundamentals of wealth creation have made the stock market investments and portfolio diversification attractive for the stock market players. The famous example of Wipro ltd, wherein a meagre Rs. 10000 worth of investments made in the stock in the early 1980's grew to a whopping 741 crores in 2019 (Rangarajan, 2019). This example showcases another gem of investment called value-based investing. The golden principle of wealth creation- "the value-based investing" framed by ace investor Benjamin Graham coupled with appropriate portfolio diversification strategies will make the investments grow by leaps and bounds in the long run.

Stock Market plays a pivotal role in the growth of the industry and commerce in a country. As stock markets also signal the growth of an economy, government and central banks keep a close watch on the ups and downs in the stock market. The stock market is important for the industry as well as for investors. As far as investors are concerned, their investment preference always relates to stocks of those sectors with maximum returns and minimum levels of risks. Construction of a portfolio of multiple assets helps investors get maximum returns at a given level of risk (Abreu & Mendes, 2009). However, the large input data requirement and enormous time make the risk-return analysis cumbersome. In this context, index models for portfolio selection is a reliable method as the overall performance of the stock markets is usually tracked and reflected in the performance of various stock market indices.

Information about stock market helps the investor to invest in the markets with potential diversification benefits. Here an investor can increase return or reduce risk by diversifying his investment portfolio in segmented stock markets. Instead of orienting equity investment to one company or sector, the best option is investing in large mid and small-cap stocks across high growth stable sectors (Vlastakis & Markellos, 2012). Other studies related to the amalgamation of the stock markets and the financial markets also helps investors figure out the benefits and limitations of portfolio diversification (Ahmed, 2011). Another important aspect of being considered is the international transmission of shocks among national stock markets which widens the scope of stock market integration or segmentation. The policymakers who are well informed of stock market integration or segmentation could clearly understand the sectoral connections which help them take precautionary measures to prevent the systemic shocks to ensure the stability of the economy (Sharma & Dhiman, 2016). With the liberalisation of economies, easement of legal barriers, increase in the number of transnational companies in the countries etc, portfolio diversification seems to be a challenge even to the most expert investors. Along with this, the high uncertainty in the financial and economic environment across the world makes it look like an almost impossible task.

Allocation of capital to stocks from different sectors is subject to the performance and anticipated growth of the concerned sector. Thus, the investors could create a portfolio by this sectoral allocation and keep on revising this portfolio by favourable new information from the concerned sector. The investors can observe the performance of various sectors from the respective sectoral indices. The success of investors, fund managers and other market players depending on their knowledge on market integration. Studies on stock market integration at the sectoral level highlight the importance of sectoral analysis as it determines whether the impact of the crisis on the main indices is consistent at the sectoral level as well (Arvind, 2017).

The investor selection of specific stocks depends on their risk-return perspectives. Measured risk brings prospects of higher returns. While operating riskier investments, risk management strategies should evolve to mitigate losses. Instead of orienting equity investment to one company or sector investing in large and small-cap stocks across high growth and the stable sector is apt action. While evaluating a stock for investment, study about its price movement and financial health of the company is of utmost importance (Jorion, 2000). Based on these cautions, the performance of stock markets can quickly identify and judged by an investor by looking at its market index. The market index provides a yardstick to measure the performance of a particular stock and also provide investors for forecasting future trends in market movements. Thus, choice of individual stocks within each of the selected area could be made by the individuals or portfolio managers based on analysis which generally aims at accrual of higher returns, given a risk level (Cowles, 1944).

Sectoral linkage has become one of the most discussed topics in the portfolio creation process (Yilmaz et al., 2015; Sieczka & Hołyst, 2009; Garas & Argyrakis, 2007) The linkage among various sectors in Indian stock market should be analysed on the basis of sectoral interlinkages. The studies of sectoral inter-linkages are all the more important for a developing country like India so that positive growth stimuli among sectors could be identified and fostered to sustain the economic growth momentum. Identifying sectoral linkages and correlations in the stock market would also help the investors diversify their investment portfolio, thereby reducing the risk of making a huge loss by 'putting all eggs in a single basket'. This study has used a multivariate Granger causality test by fitting a Vector Auto Regressive (VAR) model to assess the mutual causal effect among eight sectoral indices in National Stock Exchange (NSE) namely, IT, PHARMA, REALTY, MEDIA, AUTO, BANK, FINANCIAL SERVICES and FMCG for a period spanning 10 years starting from January 2009. The results of the Granger causality test would help descry the unobserved interlinkages among these eight sectors and would provide useful insights to the investors to diversify their existing investment portfolios.

Review of literature

There are a number of studies examining the inter-sectoral correlation among different sectors in the stock markets around the world. The relevant literature pertaining to this study are discussed here.

The interrelationship among sectoral indices in Athens stock market was examined by Patra & Poshakwale (2008). They used cointegration to find evidence for long-run relationship and variance decomposition to test the short-run relationship. Their results show that the banking sector was strongly correlated with other sectors in the short run, and it accounted for the major share of volatility and returns from the other sectors.

The long-run and short-run sectoral correlation in the Bombay Stock Exchange (BSE) was investigated by Noor et al. (2014), and the findings portray that except Bankex-IT and Consumer durables-Realty, no other long-run relationship was observed. The evidence for the short-run relationship was also limited. The stock market of Cyprus also showed similar trends where there was little evidence for bivariate cointegration in the long run and no active sectoral correlation in the short-run (Constantinou et al., 2008). Another study conducted in China to check the inter-sectoral correlation in Chinese stock exchanges gives evidence for strong interdependency among sectors (Wang et al., 2005).

Many studies showed that the increasing interdependency among countries might significantly reduce the benefits of portfolio diversification, especially during bearish market (Olienyk et al., 2002 and Glezakos et al., 2007). A study conducted by Ahmed et al. (2018) analysed the correlation in the sectoral indices in Colombo stock exchange using a multivariate cointegration and granger causality test. The study aimed at creating a diversified portfolio to reduce risks. The results show that the sectors were not integrated with each other, and the Colombo stock exchange offers good diversification opportunity to the investors.

Siddique (2009) asserted that the understanding of the global stock market composition is significant for both investors and portfolio managers in India. The study also pointed out that the individual and institutional investors should grasp a healthy diversified portfolio to decrease risk.

Sarkar et al., (2009) studied the interrelation between Indian stock market with other markets around the world and identified a strong correlation between the global stock market and the Indian stock market with the impact of US stock market on India being the most prominent.

The study of Bhalla (2011) shows that the extent of stock price volatility is influenced by the extent of integration between the domestic and international capital market as well as regulating framework governing the stock market. The behaviour of stock prices in India during the nineties was influenced by the net investment by FII and trend in the international stock exchange.

Raj & Dhal (2008) analysed the integration of India's stock market with the global and major regional market and found that there is a lack of evidence of integration of stock market in terms of local currency. This situation gives rise to concerns that the Indian stock market integration to be a success only if there is an adequate role of domestic investors.

The study conducted by Kaur et al. (2009) identified a bivariate relationship between manufacturing and agriculture sector in India. Further assessing the interlinkages between sectors, the study shows long-run association among banking, manufacturing, trade hotels, transport and communication sectors.

Harvey (1995) suggests that the improvement in market efficiency is consistent with increasing integration with world markets. But, Kim & Singal (2000) viewed that the national stock markets are different since they operate in the economic and social environments of different countries. Accordingly, a country's financial market functions when prices reflect the fundamentals and risks of other countries. Linkages among fundamentals across nations result in financial integration.

Chebby (2010) examined the link between agriculture growth and other sector growth of the economy such as manufacturing transportation, tourism, telecommunication, commerce and service sector using the Johansen Co-integration and Granger Causality in the case of Tunisia and concluded the existence of a long-run relationship between agricultural growth and other sectors of the economy.

Ahmed (2008) in his study, explored how stock prices in India led economic activity and movement in the interest rate, which significantly influences the stock prices. The study confirmed that the Indian stock market seemed to be driven not only by actual performance but also by expected potential performances.

The general lack of interest of the stock market in India in the important basic capital and intermediate good in the aftermath of the excessive attention paid to computer, software, telecommunications, electronic media, pharmaceuticals and consumer non-durables. This happens so due to investors preference for quick returns. If the stock market does not support the basic capital industries, it will undermine the efforts of the state in the form of development financial institutions. (Rao, Murthy & Ranganathan, 1999). In the case of crisis-hit ASEAN countries, the efficient capital market is more important as these are struggling to reduce the dependency on bank loans (Click & Plummer 2005).

Barari et al. (2008) showed the macroeconomic implication of stock market integration and more specific aspects of integration, such as understanding the time-varying nature of market integration among developing countries. The relationship between macro-economic variables and the stock market is dynamic and requires extensive and frequent studies to interpret the interlinkages.

The increased globalisation of financial markets resulted in a situation of smaller markets following larger markets. Aggarwal & Rivoli (1989), in their study, examined the relationship by concluding that the Asian market followed the US market movements on a day-to-day basis. This was confirmed by another study which showed that the greater the international integration of equity markets, the higher the degree of correlation among national equity prices (Cashin et al., 1995).

Most of the studies exploring the short run sectoral interdependency in stock markets used a Granger Causality test. This study also follows suit to investigate the short-run interrelationship among sectors in the National Stock Exchange (NSE) of India.

Materials and Methods

The data used for the study comprised the daily returns of the eight sectoral indices of NSE from 1st April 2009 to 28th March 2018. The sectors included in the study are IT, PHARMA, REALTY, MEDIA, AUTO, BANK, FINANCIAL SERVICES and FMCGs.The log difference of the data was taken using the following equation prior to the analysis.

R=Ln(P1/P0) ………………………..……………….(1)

Where, R is the returns, P1 denotes the current day's price, P0 shows the price for the previous day and Ln denotes the log transformation of the data.

A prerequisite for testing the cause and effect relationship using the Granger Causality test among various sectoral indices is to ensure that all the variables are stationary. The ADF test (Dickey & Fuller 1981) was conducted to check whether the variables contained unit root or not. The optimal lag structure was determined by AIC (Akaike information criteria). This empirical analysis is conducted based on the assumption that the time series data used for mathematical modelling are not stationary. Stationary time series are those in which the statistical properties will remain constant over a period of time.

Kayral & Karacaer (2017) had used the Granger Causality Wald test to find the cause and effect relationship of US stock market returns and Exchange rate changes on the stock market volatilities in emerging economies.

This study also uses a granger causality wald test to assess the short-run causal effect among the variables. For testing the relationship, first, a vector autoregressive model (VAR) was fitted, and then the Granger causality test was conducted for each equation in the VAR model. VARs are a system of

equations that depend on the outcome of other variables. The following equations show how yt and xt attain value from the lags of the x and ys.

$$yt = \beta 10 - \beta 12xt + \gamma 11yt-1 + \gamma 12xt-1 + uyt \ldots\ldots\ldots\ldots\ldots\ldots(2)$$

$$xt = \beta 20 - \beta 21yt + \gamma 21yt-1 + \gamma 22xt-1 + uxt \ldots\ldots\ldots\ldots\ldots\ldots(3)$$

Granger causality can be conducted by following a three-step procedure.

At first we regress y on y lags without considering the lags of x.

$$yt = a1 + X\,m\,j=1\ \gamma j\ yt-j + et \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(4)$$

Secondly, we add the lags in x and regress again

$$yt = a1 + X\,n\,i=1\ \beta i\ xt-i + X\,m\,j=1\ \gamma j\ yt-j + et \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(5)$$

Finally, we test the null hypothesis that $\beta i = 0\ \forall\ i\ u$, using an F-test.

Figure 1 shows the time-series line graphs for each sector with the range of variation prior to the log difference transformation.

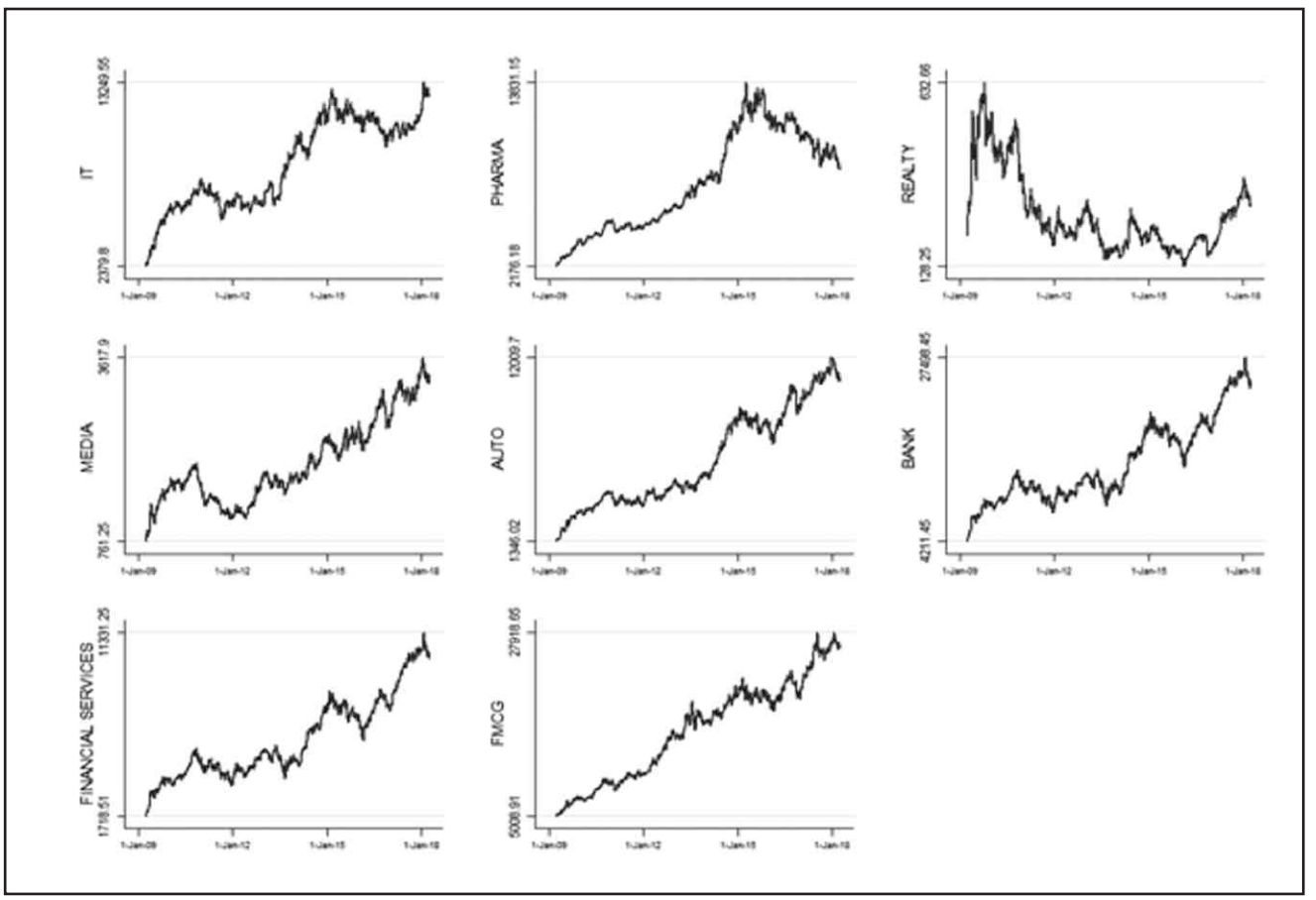

Figure 1. Sectoral Indices Line Graphs

The descriptive statistics for the variables along with the Shapiro Wilk normality tests are given in Table 1.

Table 1. Descriptive Statistics

Variable	IT	PHARMA	REALTY	MEDIA	AUTO	BANK	FIN SERVICES	FMCG
Mean	0.00077	0.00063	0.00015	0.00068	0.00097	0.00082	0.00083	0.00076
Std. Dev.	0.01387	0.01135	0.02412	0.01457	0.01317	0.01574	0.01498	0.01127
Skewness	-0.1246	0.01601	0.03867	0.30629	0.47054	0.73399	0.87895	-0.0143
Kurtosis	13.2668	10.3373	7.8991	7.2243	10.002	11.0619	13.66	6.9356
Shapiro-Wilk (W)	0.91685	0.95365	0.95993	0.97133	0.96325	0.95338	0.94525	0.96479
P Value	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**

Table 1 shows the results of the descriptive statistics along with the normality test results. From the results it could be seen that the mean returns of AUTO, BANK and FINANCIAL SERVICES were above 80% and outperformed the returns from other sectors. Except for the IT sector, all other sectors showed positive skewness. The values of kurtosis for all the variables under study are positive. The Shapiro Wilk normality test result shows that the p value for all the variables are 0.00. Hence, we reject the null hypothesis that the data under study follows normal distribution.

Table 2. Augmented dickey Fuller Test (ADF Test)

Variable	Test Statistic	P Value	Critical Values		
			1%	5%	10%
IT	-35.27	**0.000**			
PHARMA	-34.59	**0.000**			
REALTY	-33.06	**0.000**			
MEDIA	-33.26	**0.000**	-3.43	-2.86	-2.57
AUTO	-30.66	**0.000**			
BANK	-31.93	**0.000**			
FINANCIAL SERVICES	-31.916	**0.000**			
FMCG	-34.947	**0.000**			

Table 2 shows the result of ADF test. From the result it could be seen that all the variables are having lesser Test statistic than the critical values which denotes the stationarity of data sets. Data was made stationary as a prelude for doing the causality test.

Table 3. Granger Causality Wald Tests

Dependent Variables → / Independent Variables ↓	IT	PHARMA	REALTY	MEDIA	AUTO	BANK	FIN SERVICES	FMCG
IT		1.06	**8.33***	1.23	**11.9****	2.28	**7.71***	2.24
PHARMA	1.97		3.58	3.131	0.846	0.876	1.91	0.1351
REALTY	3.13	2.13		0.292	0.194	0.768	0.259	0.052
MEDIA	0.86	3.55	1.235		5.81	1.57	2.72	1.6
AUTO	3.29	3.35	2.614	1.25		0.664	0.476	4.572
BANK	**5.75***	1.63	**6.34***	1.13	4.84		1.334	1.6
FIN SERVICES	**8.23***	1.67	**8.26***	1.63	4.81	**6.14***		0.748
FMCG	2.26	2.08	2.56	0.393	**13.9****	3.14	**5.92***	

*p < 0.05, **p < 0.001.

Usually, the market treats IT and Pharma stocks as paired stocks and expects them to move together. But, contrary to the researchers' expectation, Pharma index for the given period was not moving along with IT. From our analysis, it is clear that Pharma sector still remains a defensive bet for the investors as it doesn't have any correlation with other sectors and hence could be made a part of investors' portfolio to balance the volatility.

Study further points out that IT sector stocks have lost the tag of a defensive investment as it has become cyclical in nature and is seen moving along with Realty, Automobile and Financial Services sector. This might be due to the following factors:

- The share of IT companies from the domestic market is increasing, and there is a shift in the trend wherein the domestic economy has started contributing more towards their bottom line. (Singh, 2019)
- Overseas business exposures of IT firms have started showing a bearish trend.

It is interesting to note that the performance of Financial sectoral index could be used for predicting the performance of the banking index. It may be due to the contagion effect. For instance, the issues in the companies like IL&FS, DHFL etc. did trigger a mass correction in the market values of banking stocks as most of the banks are having exposure in Financial service industry (either in the form of loans or investments). In financial terms, The IL&FS group had a systemic borrowing of nearly Rs 91,000 crore. Out of which, it has raised Rs 57,000 crore through bank loans. (Mudgil, 2018)

FMCG and Automobile stocks are showing the strong connection and hence cannot be used together (in larger proportions) for portfolio creation. From the study, it is understood that to be on a safer side, the portfolio should include stocks showing no connection with other sectors (Pharma, Media and FMCG) on one side and stocks showing dependence on other sectoral indices on another side. (realty, financial services etc.)

An ideal portfolio as per this study should constitute stocks from

1. Pharma and Media (as defensive stocks) and
2. all other sectors (as cyclical stocks)

The ideal proportion of the defensive and cyclical stocks can change from investor to investor.

Conclusion and future research directions

Our study has given an approximate solution for portfolio diversification to be made in NIFTY 50 based markets using VAR Granger causality test. The term "approximate solution" requires special emphasis because no models or trend forecasts will be able to predict the market with cent per cent accuracy. The present study was successful in explaining the changing dynamics of various sectors and suggesting the appropriate changes to be made in the portfolio based on the NIFTY 50 momentum changes. The major findings of the study imply that an efficient portfolio would consist of 50% stocks from pharma and media as defensive stocks and 50% from the rest of the six sectors as cyclical stocks.

One of the limitations of the study is that the analysis was primarily done for a period of 10 years. The study can be expanded by including data from the latest financial year. Interlinkage of various sectors of NIFTY 50 have been analyzed in the current study without considering the dynamics of various macro-economic variables. This limitation provides further scope for the study. The long term relationship among various sectors and the spillover effects among various sectors also provide scope for further research.

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Value Based Care in Healthcare Environment Providing Big Data Security and Privacy: A Review

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Abstract: - Big data is an area that provides several approaches to explore the data sets that are too large or complex type in a systematic way. It describes both structured and unstructured data that overwhelms a business on a day-to-day basis, using powerful analytics to initiate decision-making, recognize opportunities, and enhance performance. But with the enormous rise in data usage and consumption, it results in various security concerns. Healthcare is one of the important sectors that produces a lot of data because today, healthcare switches paper-based medical records into electronic platform to store, manage, analyze and process data. It is witnessing a tremendous increase in the volume of data in terms of complexity, diversity and timeliness. Here we have also explored through various challenges and opportunities in big data analytics in the medical field. Health data is also extremely sensitive, with confidentiality and integrity as a key attribute. Hence the security of the data and the need for preserving privacy of the patients in healthcare environment has become vital. So, this study mainly focuses on the security and privacy methods adopted to handle big data in the healthcare sector. Also, we have presented various issues and opportunities in the field of medical care while leaping forward to big data environment.

Keywords —Big Data Analytics, Big Data Security, Healthcare, Privacy, Security, Value Based Care

I. INTRODUCTION

With the increase usage of internet worldwide, almost all of the fields have drastically changed with latest technologies that results in generating a massive amount of data, say from kilobytes to thousands of terabytes that has to be created, replicated, and consumed. As the size of the data increases, traditional data processing software's couldn't able to achieve the expectations due to storage limit and processing speed which results in a need to collect, store, process, manage and analyze the data properly without any ambiguities. Over the last decades, there has been developing some sort of eagerness about the hypothetical usefulness of handling all these data, termed as Big Data. Despite the term Big Data have become omnipresent, there is no universal definition for it until now. But it mainly refers to the large and complex datasets that can be stored, managed, processed and analyzed to reveal some valuable information for improving business aspects. Commercial Industries, governmental institutions, Health Care Providers, and economical as well as academic institutions, are all taking advantage of the potency of Big Data to boost business scenarios which mainly aims at the enhancement of customer experience. IBM a company that runs businesses whole over the world generates nearly 2.5 quintillion bytes of data day after day. Hence for sure we can say that Big Data has pierced almost all the of industries today and has become a central governing force behind the achievement of ventures and organizations across the globe.

This paper focuses mainly on the healthcare sector that is booming at a faster pace since the requirement to manage patient care details and innovate medicines has increased synonymously. A new pattern of modernization has been in wide spread in global healthcare sector. Moreover, the digitization of health and patient records form traditional paper based recording results in abundant data that is collected from various sources like electronic health records (EHRs), medical imaging, search engines, smart phones, genomic sequencing, payor records, pharmaceutical research, government agencies, research studies, wearables, and medical devices as given in *fig 1.1*. It is witnessing a tremendous increase in the volume of data in terms of complexity, diversity and timeliness undergoing drastic and fundamental alteration in clinical, operating and business model in the world economy itself for the anticipatable future. This shift has encouraged by aging populations, lifestyle changes, explosion of various software applications and mobile devices for innovative treatment, evidence-based medicine, increased the focus of quality of care and value. All these factors offered significant opportunities for supporting scientific assessment, improving healthcare distribution, surveilling disease, management and policy creation, optimizing treatment for various ailments and monitoring undesirable events. The medical costs also reduced as a result of a change from reactive to proactive healthcare. While utilizing the power of data, threats and vulnerabilities will continue to grow that

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gives more focus on security and privacy. Hence, it is essential to implement healthcare data security solutions for protecting important resources satisfying healthcare compliance mandates [1]. Hereafter, we will look through some data security approaches specifically for healthcare sector, that will help in protecting the medical data as well as patient privacy.

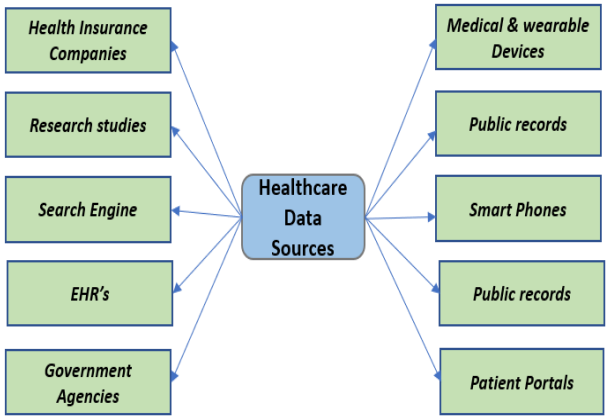

Figure 1.1: Sources of data in healthcare sector

This paper has organized in such a way that Section 2 describes the concepts of big data in healthcare, its characteristics and properties, Section 3 represent conceptual architecture and major challenges faced in this field, Section 4 & 5 covers various security and privacy approaches employed as well as the opportunities in the field of healthcare.

II. CONCEPTS OF BIG DATA

According to McKinsey Global Institute it refers to *datasets whose size is outside the capacity of typical database software tools to capture, store, manage, and analyze [2]*. In *[3]*, the author proposed the widespread description of big data with the '3V's': *Big Data is volume, high-velocity and high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making*. Some others also, characterize big data by a fourth 'V' that is Veracity which focus on legitimacy, quality, and trustworthiness of data. The 4V's are the main factors that influences big data which is explained as below.

Velocity: It is the speed and frequency at which data is generated, captured and shared. Consumers as well as businesses now generate lots of data and in most shorter cycles, from hours, minutes, seconds down to milliseconds.

Volume: It is the amount of data produced by organizations or individuals. All organizations are searching for ways to handle the ever-increasing data volume that's being created every day.

Variety: It is the proliferation of new data types including those from social, mobile and machine resources. New types include content, metrics, mobile, physical data points, process, location or geo-spatial, hardware data points, machine data, radio frequency identification (RFID), search, and web. It also includes unstructured data.

Veracity: It is defined as the confidence or trust in the data. It actually refers to the reliability of the data source, its context, and meaningfulness of it to the analysis based on it. Incorrect data can cause a lot of problems for organizations. Hence, organizations need to ensure that the data is correct as well as the analyses performed on the data are correct. In automated decision-making, where no human is involved, we need to be sure that both the data and the analyses are correct.

In addition to this nowadays a number of other V's have been added to this. Some of them are listed as below.

Value: It is defined as the ability of the big data to transform data into appropriate indications that helps in different business purposes.

Variability is different from variety. A coffee shop may offer 6 different blends of coffee, but if you get the same blend every day and it tastes different every day, that is variability. The same is true of data, if the meaning is constantly changing it can have a huge impact on your data homogenization.

Visualization is critical in today's world. Using charts and graphs to visualize large amounts of complex data is much more effective in conveying meaning than spreadsheets and reports chock-full of numbers and formulas.

Volatility means the organizations should make sure that how long their data needs to be kept to consider as irrelevant, historic or not useful. For this proper rule has to be established for data currency and availability as required.

Validity is sometimes similar to veracity and defines the accuracy of the data. Before doing any sort of analysis, data scientists spent most of their time for cleansing the data. Big data analysis will be benefitable only if there are good data governance practices ensuring data quality, common explanations and metadata.

III. BIG DATA IN HEALTHCARE SECTOR

Big data by eradicating scam and exploitations has created a big transformation in the field of healthcare providing better outcomes. It also contributes to a large percentage of healthcare costs. The healthcare industry generates massive amounts of data about each and every suffering person but accessing, managing, and interpreting that data is vital to generate actionable visions for better care and efficiency. Clinical practices likewise assume a function in the rise of information in medical services. Earlier doctors used their own experience and judgements to make treatment decisions, however the most recent

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couple of years have found a shift in the manner these decisions are being made. Nowadays, Physicians review the available clinical data from various sources, the possible treatments and medicines, and their side effects with the help of modern technologies and make a well-versed decision about a patient's treatment. Money related concerns, better insights into treatment, research, and productive practices add to the requirement of big data in the medical care industry.

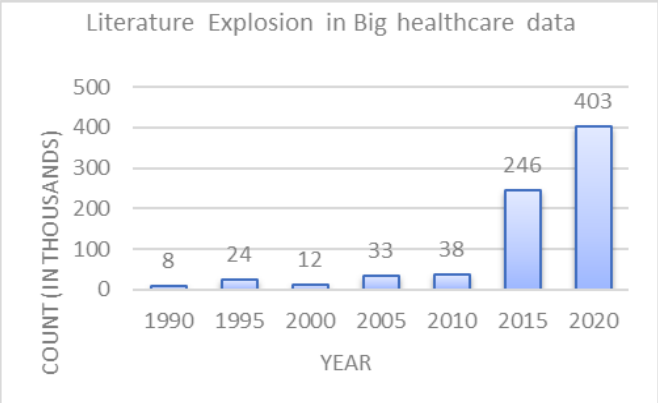

Figure 3.1 Literature explosion searched with 'Big healthcare data' in PubMed

In traditional systems, the clinicians use structured data for prediction but since the data is increasing and they can have multiple forms which results in unstructured data that arises from internal as well as external sources. For the proper storage, maintenance and analysis of these data requires modern analytical tools and techniques so that the visualization of new patterns helps in diagnosis as well as prediction of new diseases. These predictive analyses could help to reduce the wide spread of epidemic diseases like Ebola, Covid-19 etc. Since the new technologies like Big Data, Internet of Things, Machine Learning, Data Science, Cloud Technology, etc are incorporated in the medical field, they could able to focus more on enhanced quality and patient care by proper analysis. In figure 3.1, we have shownn a statistic of data explosion in healthcare as in 1990 it was only 0.8ZB but in the year 2020 it has raised to 40ZB. This rise has result in more literature explosion as well.

A. Conceptual Architecture

In figure 3.2 we have shown a conceptual architecture of big data technology in healthcare environment. Various steps involved are discussed below.

Data Capturing: - Data comes from various sources and can be in different formats. For proper analysis and interpretation, the collected data should be clean, complete, accurate and formatted so that it can be applied to multiple systems. In one recent study at an ophthalmology clinic proved that poor EHR usability, convoluted workflows, and an incomplete understanding of the importance of big data to capture well can all result in quality issues that will wave data all over its lifecycle.

Data Transformation: - Data cleaning is an important area in big data processing as it is a process that ensures the accuracy, consistency, relevancy and integrity of the datasets. Data to be analysed collected from various sources can be in different formats, so there is a need to clean or scrub the data properly to infer new information. Earlier most of the cleansing processes are done manually, but nowadays some IT vendors are offering automated tools to compare, contrast and validate the datasets. Due to the popularity of machine learning techniques these tools have become more precise which results in time and expense reduction ensuring high accuracy and integrity in healthcare data warehouse.

Data Storage: - Physicians and health workers are rarely aware about the storage of data, but for IT department it has become critical in terms of cost, security and performance. Many of the organizations prefer on premise data storage, but on-site server can be expensive to scale, difficult to maintain, and produces data losses. In order to overcome this issue, cloud storage has become a popular option. According to a survey report, almost 90 percent of the healthcare organizations are using cloud-based services in terms of infrastructure, software and applications and should be very careful about healthcare specific compliance and security issues. However, the most flexible and workable approach is a hybrid infrastructure approach, providers should be careful to guarantee that dissimilar systems can share data and link together when necessary.

Security: - Security should have a high precedence as a lot of high-profile breaches, and hackings results in various vulnerabilities these days. The Health Insurance Portability and Accountability Act [9] includes a long list of security and privacy rules for organizations storing and sharing protected health information (PHI). In practice, these safeguards translate into common-sense security procedures such as using up-to-date anti-virus software, setting up firewalls, encrypting sensitive data, and using multi-factor authentication.

Stewardship and Metadata: - Medical data has a long shelf life and should be kept for at least 10 years. Analysts utilizes these data for research purposes and also for quality measurement and performance benchmarking. Understanding when the data was created, by whom, and for what purpose – as well as who has previously used the data, why, how, and when – is important for researchers and data analysts. Creation of metadata is vital for scientific studies and the need for a data steward can ensure the standards and formats of all documented elements from creation to deletion.

Big Data Analysis: - This step involves steps like querying, reporting and visualization. Querying is essential for proper reporting and analytics. The organizations should overcome

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the interoperability problems that prevent the tools from accessing the data repository. After query process, the analyst has to generate reports that is clear, concise and accessible by the users to draw his or her own inferences about the data spectrum. Visualization helps the clinicians

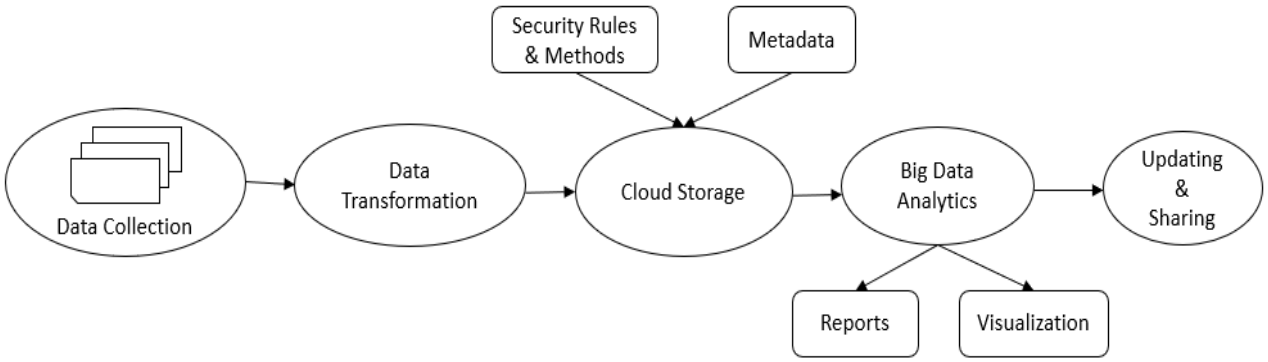

Figure 3.2 Architecture of big healthcare data analysis

to view the results and use it appropriately. Color-coding, charts, histograms, scatterplots etc are some of the commonly used visualization tools in big data analytics.

Updation and sharing of data; - Data will not remain static, it will be changing each and every second. So, it is major challenge to continuously monitor the data assets. The providers should have clear idea about manual updation and automated updation of these datasets without any comprise in the quality and integrity matters. Also, they must be aware about the duplicate records while updation which makes it difficult to access information for patient decision-making. In order to construct a big data exchange ecosystem, sharing data and tools with external parties is essential for value-based care. Advance tools and techniques like FHIP, public APIs etc help developers to share data easily without security concerns.

B. Issues faced by healthcare sector

As in every field, increase in demand results in more challenges and opportunities. Every organization faces some issues regarding data storage, accessibility, quality, integrity, privacy and security. Medicare industries mainly faces issues regarding security and privacy, data retention and data management.

Issues: - Issues with data capture, cleaning, storage and retention is one of the key challenges of healthcare analytics. Since the volume and variability of data is increasing, collection of appropriate data and transforming the data to preferred format is of important. In healthcare the data that is extensively used is self-reported data and it should be consistent [6]. Keeping information up to date as well as accurate is a challenge of data collection. Data structure related issues are addressed in lot of articles [10,11,12]. It is essential for the big data applications to be more transparent, user-friendly and menu driven so that the data processing can be simplified. Most of the available data are unstructured mainly from the natural language processing which is fragmented and rarely standardized. Data standardization [11][17] and cleaning is another issue that should be done with utmost care since it results in less efficiency, integrity and accuracy. As the data is used for research purposes, and it has to be shared with different applications and technologies proper standardization is required. Also, it has to be maintained for a longer period and proper storage mechanisms like cloud-based technology [22] should be selected which provides additional security layer for extraction, transformation and loading of patient records.

Privacy and Security are the most important issues faced by the healthcare businesses. Data hacking [20][21] will be extremely profitable for the hackers and harmful for the organizations. Electronic health records may contain details of personal as well as financial details which result in identity theft and even blackmails. It is illegal to share these sensitive data without prior permission which causes financial costs and reputational costs which may remain for long periods and are harder to measure. HIPAA formed in 1996, to protect privacy and secure sensitive data. All healthcare providers must focus to meet the HIPAA rules by implementing data protection through masking and encryption methods to avoid illegal access of data.

Most of the patient records these days are stored in a centralized database for quick and easy access, but the real challenge lies when this data has to be shared among outside medical practitioners. Although EHR data within the healthcare environment may follow common standards, but pharmacies, external healthcare providers may use different systems which makes sharing and integrating medical records a cumbersome task. The medical records

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maintained by the healthcare providers and the billing department on the hospital floor need to be reflected accurately while making insurance claims. But often, there is a lack of integration between the administrative and clinical systems with mismatch among data management systems and a variation exists among treatment codes and care given to the patients.

IV. SECURITY AND PRIVACY STRATEGIES

Security and privacy are the two important concerns and challenges faced by most of the organizations worldwide when it is related to big data. Security is important for protection of data but it is inefficient to address the problems of privacy. Security and privacy are two terms that should be acted independently for the efficient management and quality of the data as well as the organizations. Security mainly focuses on the confidentiality, integrity and availability of the data. Main intention of security is to safeguard the data from unauthorized access. While privacy is the term used to safeguard the user's identity. Differences between the terms has been mentioned below in the table 4.1. Security is important to protect the data from any sorts of vulnerabilities but it is not sufficient for providing privacy to the users.

Security	Privacy
Protection against unauthorized access	Protect personally identifiable information
Protection for all types data including electronically stored information.	Protection for sensitive information related to individuals and organizations.
Security can be achieved without privacy	But good privacy cannot be achieved without good security practices.
Security protocols are used for maintaining confidentiality, integrity and availability of assets	Privacy protection rights are used for protection and processing of personal data.
For example, an organization uses various technologies like encryption, firewall etc. to prevent data compromise or vulnerabilities in the network.	If a patient has to pay the bill, he will be giving his name, address, treatment details etc., but the providers are not supposed to share the details to any third party without prior consent of the user.

Table 4.1 Security Vs Privacy

In [6] the author Kin et al. claims that big data security present mainly three factors like data security, access control and information security. Yazan A. et al [7] proposed a big data security lifecycle model that comprises of four phases like data collection, data storage, data processing, and knowledge creation. The main focus of this paper was to coin out various threats and attacks that affects the big data environment within these phases. As an advancement to this Kanika et al. [25] developed a security model with five phases including data creation phase, data collection phase, data mining phase, data analytics phase and decision-making phase explaining threats and their solutions through different phases of the life cycle. At all the stages it includes confidentiality, integrity and access control mechanisms.

A. Security Threats and Solutions

As mentioned above each phases of big data security models are vulnerable to different threats and attacks. Data collection phase are vulnerable to attacks like phishing, spoofing and spamming. To prevent this Thilakanathan et al. [26] proposed encryption methods like double encryption, symmetric encryption and ElGamal algorithm. Major threats to data integrity was faced in the data transformation phase. Content Based attacks, distributed/denial of service attacks affecting the infrastructure from inside and outside the organization are commonly seen in this phase. Data mining attacks, re-identification of patient information is maintained by a double layered architecture [27] [29] using AES and RSA algorithm. Finally, the information generated by data modelling is very crucial that should not be disclosed publicly. So, this phase is vulnerable to various privacy issues and phishing attacks targeting the decision makers. Proxy based complete homomorphic encryption [30] and Group Signatures [31] are proposed as a solution to these issues. Various technologies are available to ensure security and privacy of big healthcare data.

- Authentication: - ensure the authenticity of a user by protecting the identities of users and secure access to corporate networks. Hashing techniques, like SHA-256, Kerberos mechanisms, and Bull-eye algorithm can be used for monitoring all sensitive information to achieve authentication.
- Encryption: - An efficient way of preventing unauthorized access to data is data encryption. It protects the ownership of data throughout its lifecycle and useful to avoid packet sniffing and theft to storage devices. Health providers must make sure that it is easy to use and efficient too. Furthermore, the number of keys used by the parties should be minimal.
- Data Masking: - Replaces important data with some unidentifiable elements. Since it is not an encryption method, the original value cannot be reverted back. It is a most popular approach for data anonymization which reduces the cost of big data deployment avoiding the need of any additional security.
- Access control: -Access to a system is governed by certain access control policies based on some privileges and rights given to the users. It is the most powerful and flexible mechanism granting permission for the users. Role based and attribute-based access control mechanisms are most popular methods for EHR's.
- Monitoring and Auditing: - Monitoring is used to gather the network related events to catch the intrusions. Various intrusion detection models are used for this purpose. Auditing is also needed to record the user

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activities in sequential order for keeping a log of every access and modification of the data.

B. Privacy Preservation in big data

A rising concern in the field of big data is the attacks on patient privacy due to persistent attacks against information systems. A major incident reported on Forbes magazine [32] compels analytics and developers to focus more on privacy in big data. Healthcare organizations that handle bulk amount of fitness-related data must meet a series of requirement in order to ensure privacy of data [33-35]. They are access to confidential information, secure storage using electronic media, back-up copies of all data, encryption of data, use of physical media for confidential information, and system for managing security related incidents. Privacy-preserving techniques fall into the following categories: data modification techniques, cryptographic methods and protocols for data sharing, query auditing methods, statistical techniques for disclosure and inference control, and randomization and perturbation-based techniques.

Privacy laws: - In 1981 European Convention on Human Rights was the first in the world to address privacy issues related to automated processing. It was set out to ensure every individual to secure his or her privacy in preserving personal data regardless of nationality or residence. The convention expressly prohibits the processing of data unless the law provides appropriate safeguards. As a result, it is unlawful to process medical information about a person unless one has a legal basis to do so, such as an existing doctor-patient relationship. Different countries have laws and policies for privacy protection.

Privacy preservation methods: - Some of the methods used are mentioned below

- De-Identification – traditional method prohibiting the disclosure of confidential information by removing some identifiers or by using some statistical methods to delete enough information. But it is not that much useful, hence concepts of K-anonymity, l-diversity and t-closeness have been introduced to enhance this method.
- Generalization: - In this method most of the data available has been generalized. For example, Birth field has been generalized to year and Zip code to wider area which provides data anonymization.
- HybrEx: - is a hybrid execution model in cloud computing for confidentiality and privacy. This model uses both private as well as public cloud for processing and sharing of data. If the organization reports that no privacy and confidentiality risk is there in exporting the data, then it will use the public cloud, whereas for the computation of sensitive information private cloud will be used. If the application requires both private and public data, then the application itself partitioned and runs in both private and public clouds.
- Identity Based anonymization: - Mainly intended to privacy protection that sanitizes information. Here the person whom the data describes remain anonymous with certain encryption methods.

V. OPPORTUNITIES

Despite the challenges of big data, advanced analytics offer a lot of opportunities in the health care industry in terms of cost, quality, and access. Some of them are mentioned below.

Big data has a great potentiality in improving the quality and value-based care. It can predict outcomes with the help of available historical data and ensure standardization of industry-wide care [20,37]. Quality can also be improved by the efficient use of information that helps in analyzing real-time resource consumption throughput. The use of predictive analysis can also help in the reduction of readmission of patients by classifying them on the basis of risk of readmission. Management of population health specially focusing on aging of the population and age-related health issues both locally and globally has become more salient nowadays [38,39]. By using analytics in health management, healthcare contributors can be able to identify patients who are at high risk by effectively reviewing problems, diagnosis, and analysis of lab results through EMR. Early detection of diseases is another opportunity of big data analytics which assists in achieving improved treatments and higher patient outcomes. It can also help in preventing deadly illness and can track and monitor healthy behaviors and conditions [40][39]. Decision making process can be improved with accurate and up to date information motivated by new technologies and treatment procedures within clinical research. Increased use of technology has shifted the medical sector form disease centric to patient centric care allowing the availability of information directly to the patients [40]. Fraud detection, globalization of data, threat detection are some of the other opportunities mentioned in the literatures.

VI. CONCLUSION

Health care systems with a shift from traditional methods to more advanced technologies results in great amount of data known as Big Data. These data can be stored, processed and analyzed with various methods so that new information or inferences can be generated for the value-based care. A conceptual architecture has been discussed here describing the process involved in big data analytics in the field of healthcare. It helps in early detection of diseases, reduction in costs, management of population health, reduction in readmission of patients, easiness of decision-making process etc. Other than the opportunities, various issues also have been discussed in this paper, giving more focus on the

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security and privacy concerns. Since the importance of inferencing and analysis of big data is rising in every fields, more security and privacy preserving tactics have to be followed to ensure confidentiality, integrity and availability incorporating cloud-based technologies.

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Wound healing potency of *Hemigraphis alternata* (Burm.f) T. Anderson leaf extract (HALE) with molecular evidence

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Hemigraphis alternata (Burm.f) T. Anderson, commonly called as Red Ivy or Purple waffle plant and locally, *Murikootti* (Malayalam), is well known traditionally for its therapeutic effect in wound healing. Besides the analytical and biochemical evidence, more investigations at molecular level is inevitable for highlighting the healing effect of the herbal drug. In the present study, we have demonstrated the wound healing effect of *H. alternata* by *in vitro* cell line and animal model experiments using the *Hemigraphis alternata* leaf extract (HALE). The cell survival ability, cell proliferation and migration of cells in scratch wounds leading to wound closure were evident from the data by HALE treatment. Based on the wound closure observed in scratch wounds, the marker genes of wound healing PAI-1 and TGF-β1were analyzed by qPCR. The concentration and the expression fold were determined in 3T3-L1 and L6 cell lines treated with HALE. The concentration of marker gene of wound healing PAI-1 and TGF-β1showed significant increase in cell line cultures of 3T3-L1 and L6 cells treated with different concentrations of HALE (P <0.05). Similarly, the expression fold of both the genes was found higher in cells treated with HALE than the control. The molecular data showing the concentration and the expression of marker genes during wound healing in scratch wounds provide strong support for using HALE as a herbal medicine with the anti-inflammatory property and the antioxidant activity.

Keywords: Anti-inflammatory, Antioxidant activity, *Murikootti*, Plasminogen Activator Inhibitor 1, Purple waffle plant, Red Ivy, Traditional medicine, Transforming growth factor beta 1

Bioactive compounds are secondary metabolites synthesized as products of biochemical side tracks in the plant cells with several pharmacological and toxicological effects in man and animals[1,2]. The search for natural remedies for wound management and healing has led to screening of plants including *Acrtium lappa*[3,4], *Aloe vera*[5,6], *Astragalus propinquus*[7,8], *Bauhinia variegata* L.[9], *Calendula officinalis*[10], *Celtis timorensis* Span[11], *Juglans regia* L.[12], *Verbascum inulifolium*[13], etc. as potential source of phytomedicine. Therapeutic potential of plant secondary metabolites remains as the main source of herbal medicine[14]. *Hemigraphis alternata* (Burm.f) T. Anderson (Fam. Acanthaceae), commonly called the Red Ivy or Purple waffle plant, and locally known as *Murikootti* (Malayalam), is a tropical herb used as a folklore medicine for wound healing traditionally[15]. Its aqueous leaf extract shows significant healing effect in fresh wounds, particularly in wound closure[16]. Despite the traditional knowledge of the medicinal effect of *H. alternata*, in depth scientific analysis at biochemical and molecular level focusing towards the mechanism of herbal action in wounds is still lacking[17]. The application of the aqueous leaf extract of *H. alternata* in fresh wounds exhibits a wonderful healing effect in wound closure[18]. In folk medicine, it is used to heal ulcers, to promote urination, to cure anemia, gall stones and diabetes and as a contraceptive[19].

Previous reports substantiate the wound healing property of *H. alternata* with analytical and phytochemical evidences[16]. With the presence of active components such as phenols, flavonoids, terpenoids, saponins, coumarins, carboxylic acid, cinnamic acid and tannins in *H. alternata*, which vouches for the wound healing property, the clinical acceptance of *H. alternata* leaf extract (HALE) in wound closure requires molecular evidence[20]. Healing of wounds is a well orchestrated process that involves several cellular and molecular events[21,22]. From the

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earlier level of hemostasis and inflammation of the wound to the later stages of healing like angiogenesis, cell proliferation, regeneration and functional restoration, different growth factors and cytokines of the body systems are actively involved[23,24]. Hence, investigation on the involvement of these innate growth factors of the system during wound healing at molecular level may provide a new scientific outlook and thereby vindicate application of traditional herbal medicine. In the present study, we have made an attempt to determine the effect of Transforming Growth Factor beta 1 (TGF-β1) and Plasminogen Activator Inhibitor 1, (PAI-1) genes during healing process in scratch wound of cell line and in animal models under the treatment of HALE. An attempt was also made to understand the biochemical factors that trigger the healing process by HALE.

Materials and Methods

Collection of plant material

Since *Hemigraphis alternta* is an ornamental plant of mesophytic habitat, we maintained a garden at our premises for the experimental purpose. The taxonomic status of the plant was authenticated by Botanical Survey of India (BSI) Coimbatore as *Hemigraphis alternata* (Burm.f.) T. Anderson, and a voucher specimen of the plant BSI/SRC/5/23/2016/ TECH/1554 were deposited. Fresh healthy and mature leaves of *H. alternata* were taken from the basal nodes of the plant was used for the study.

Preparation of *H. alternata* leaf extracts (HALE) powder

One kg of fresh tender leaf of *H. alternata* was surface sterilized by washing in tap water and rinsed with sterile water and ground in a waring blender with equal volume of RO water. The aqueous extract was filtered through a two layered cheese cloth and was centrifuged (Remi, India) at 10000 rpm for 10 min as the standardized conditions for efficient separation of residual particles. The supernatant obtained after the centrifugation was lyophilized by freeze-drying (VirTis Genesis, USA)**.** The freeze dried powder was reconstituted (mg/mL) in sterile water. Two different concentrations of the reconstituted HALE (10 µg and 100 µg) were used for the study.

Biochemical evaluation of HALE

Anti-inflammatory activity using HALE

Human Red Blood Cells (*HRBC*) *membrane stabilization assay*

RBC was separated from human blood using the standard procedure and suspended in 10% normal saline solution[25]. The reaction mixture (3 mL) consists of 1.5 mL aqueous solution containing 100 µg HALE, 1.5 mL of 10% RBCs suspension. Saline was added to the control tubes as blank. Aspirin was used as a standard drug (250 µg/µL) instead of test sample as positive control[26,27]. The reaction mixture was incubated in water bath at 56°C for 30 min. At the end of the incubation, the tubes were cooled under running tap water. The cooled mixture was centrifuged at 3200 rpm for 5 min and the absorbance of the supernatants was taken at 560 nm. The experiment was performed in triplicates for all the test samples, and percentage inhibition of hemolysis was calculated using OD values.

Inhibition of albumin denaturation

The anti-inflammatory activity of the HALE was studied using inhibition of albumin denaturation technique[28]. The reaction mixture consists of 50 µL HALE extract (100 µg) µL) and 5% aqueous solution of bovine albumin fraction (450 µL). The pH of the reaction mixture was adjusted to 6.3 using 1N HCl. The mixture was incubated at 37°C for 20 min and heated at 57°C for 30 min. After cooling, 2.5 mL phosphate buffer saline (pH 6.3) was added to the sample, the absorbance was measured spectro-photometrically (ELICO, India) at 660 nm. The experiment was performed in triplicates with the drug aspirin (250 µg/µL) as control[29]. The Percentage inhibition of protein denaturation was calculated as

$$\text{Percentage inhibition} = A_{\text{control}} - A_{\text{sample}} / A_{\text{control}} \times 100$$

Proteinase inhibition

About 3 mL reaction mixture was prepared with a composition of 2 mL 25 mM Tris-HCl buffer (pH 7.4) with the enzyme trypsin (0.06 mg) and 1.0 mL HALE sample. The mixture was kept at 37°C for 5 min and l.0 mL of 0.8% (w/v) casein was added as substrate. The total mixture was incubated for 20 min at 37°C and 2 mL of 70% perchloric acid was added to arrest the reaction. After incubation, the suspension was centrifuged and the absorbance of the supernatant was read spectrophotometrically at 210 nm against buffer as blank[30]. For the positive control, 1.0 mL aspirin (250 µg/µL) was taken instead of HALE extract. The percentage inhibition of proteinase activity was calculated from the absorbance value.

Antioxidant test

DPPH free radical scavenging assay

The free radical scavenging activity was tested as per the protocol[31]. The reaction mixture contained 50 µL of HALE (100 µg) extract, 1.5 mL DPPH reagent

(1.0 mM) and 1.5 mL of 80% methanol. The mixture was incubated in dark for 30 min and the absorbance was read at 517 nm. The scavenging potency was measured from the OD value[31].

Nitric oxide free radical scavenging assay

Aqueous HALE extract (mg/mL) was prepared and the final volume was made up to 10 mL. One mL above extract containing 100 µg was taken along with 1.0 mL (100 mM) sodium nitro prusside (SNP). The mixture was incubated for 2.5 h at room temperature (25°C), added with 1.0 mL of Griess reagent and the OD was measured at 540 nm[32] and calculated as

Percentage of Scavenging = $A_{control}$- A_{sample}/$A_{control}$ X100

***In vitro* cell line cultures**

Establishment of cell line cultures 3T3-L1 and L6 cells

Mouse 3T3-L1 fibroblasts cells and Rat L6 pre-myoblast cells were procured from cell repository of National Centre for Cell Science (NCCS), Pune. The cells were cultured in Dulbecco's modified Eagle's medium (Himedia, Mumbai) supplemented with 100 U/mL of penicillin, 100 µg/mL of streptomycin, 250 ng/mL amphotericin B and 10% heat-inactivated FBS (PAN Biotech). Cultures were maintained in a humidified atmosphere with 5% CO_2 at 37°C. The cells were seeded at a density of approximately 2×10^3 cells/mL for experiments.

Scratch wound assay

The 3T3-L1 fibroblast cells and Rat L6 pre-myoblast cells were seeded onto 6-well culture plates for scratch wound assay. Cell cultures were incubated overnight at 37°C and 5% CO_2. The cells grown in uniform monolayers were scratched with a sterile 200 µL tip. The wounded cells were rinsed thrice with filter sterile PBS of pH 7.2 to remove the detached cells[33,34]. The wounded cells were incubated with 1.9 mL of serum free medium containing DMEM with 1% antibiotic and antimycotic solution. The wounded monolayers were treated with two different concentrations of HALE (10 and 100 µg). Sterile water was added in untreated control wounds. The experiment was done in duplicate wells for each trial. The wound closure was monitored for 24 h using inverted phase contrast microscope (Lynx, Lawrence& Mayo, India) equipped with camera and measured using software View 7 version 7.1.1.6.

Cell viability assay

The effect of the HALE on cell viability was assessed by 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl-tetrazolium bromide (MTT) assay following the method[35]. Percentage of viable cells at particular concentrations of extract was calculated by using the following formula: Viability (%) = (AT /AC) × 100 where the AT and AC are the absorbance of treated and control cultures, respectively at 470 nm.

qPCR assay of molecular marker genes

Absolute quantification of PAI-1 and TGF-β 1 gene in cell lines

Gene specific oligonucleotide primers for PAI-1 gene of rat (NM_012620) and TGF-β1 gene of mouse (NM_011577.2) were designed using Vector NTI (Invitrogen) and synthesized at Sigma-Aldrich, Bangalore. The wounded cell lines both 3T3-L1 mouse fibroblast monolayers and L6 rat pre-myoblast monolayers were treated with HALE extracts for 24 h, along with the untreated cells as the control. Total RNA was isolated using TRI-reagent (Sigma, Bangalore)[36]. About 4 µg of total RNA was transcribed to cDNA using 100 ng Poly T primers (Fermentas, Canada). cDNA amplification was carried out in a total volume of 20 µL in the presence of 2 pM each of the forward primer (5'-TCAGCCCTCA CTTGCC TCAC-3') and reverse primer (5'-ATAGCC AGCACCGAGGACAC-3') of rat origin Plasminogen Activator Inhibitor 1 (PAI-1) and 2pM each of the forward primer (5'-CTGCTGGCA GTATCCAG GGCTCTCCG-3') and reverse primer (5'-GGTGGG GTCTCCCAAGGAAAGGTA-3') of mouse origin for Transforming growth factor Beta 1 (TGF-β1) using RNA isolated form cell cultures. The PCR assay for amplification of PAI-1 and TGF-β1 gene were standardized at following cycling condition 94°C for 4 min followed by 34 cycles of 94°C for 1.0 min, 60°C for 30 s and 72°C for 45 s, with a final extension of 72°C for 10 min and held at 4°C. The real time PCR amplification of PAI-1 and TGF-β1 and gene was run separately on a Realplex instrument with Realplex 1.5 software (Eppendorf, Germany) and the threshold cycle (CT) was determined using the software. All the PCR runs were performed in triplicate and each reaction mixture was prepared using 2X SYBER mix (ABI) in a total volume 20 µL containing 50 ng of template cDNA, 2 pM sense and antisense primer and 1X SYBER Green. The reaction was set for 40 cycles with the conditions: initial denaturation 95°C for 10 min, denaturation 95°C for 15 s, annealing 62°C for 15 s and elongation 72°C for 45 s. After completion of cycling process, samples were subjected for melting analysis by following

conditions as 95°C for 15 s, 60°C for 15 s and 95°C for 15 s. Tenfold serial dilution series of the gene PAI-1 and TGF-β1 ranging from 50 ng to 0.05 ng reactions was carried out to construct the standard curve[31]. The CT value was plotted against the logarithm of their initial template copy concentration. The efficiency curve was generated by a linear regression of the plotted points. From the slope of the curve, the PCR efficiency (E) was calculated according to the following equation: E= 10[(-(-1)/slope)] -1.

Relative quantification of PAI-1and TGF- β1gene in cell lines

The relative quantification of PAI-1 and TGF-β1 gene and their expression in HALE treated samples were determined using 2-ΔΔCT method[36,37]. All samples in triplicate were run in a single reaction. The primers taken for the qPCR were same as that used for the absolute quantification of the genes. The real time PCR amplification was run on a Realplex instrument with Realplex 1.5 software (Eppendorf, Germany) and the threshold cycle (CT) was determined using the software. The wounded 3T3-L1 mouse fibroblast monolayers and L6 rat myoblast monolayers were treated with HALE extracts for 24 h, along with the untreated cells as the control. Total RNA was isolated using TRI-reagent (Sigma, Bangalore). About 4 µg of total RNA was transcribed to cDNA using 100 ng Poly T primers (Fermentas, Canada). cDNA amplification was carried out in a total volume of 20 µL in the presence of 2 pM sense and antisense primers. The PCR assay was standardized at following cycling condition 94°C for 4 min followed by 34 cycles of 94°C for 1.0 min, 60°C for 30 s and 72°C for 45 s and a final extension of 72°C for 10 min and held at 4°C for amplifying the partial PAI-1 gene and TGF-β1 gene. The reaction mix for the amplification of the house keeping gene actin included 50 ng cDNA, 2 pM primer mix each of the forward primer (5'GTCCCTCACCCTC CCAA AAG-3') and reverse primer (5'-GCTGCCTCAACA CCTCAA CCC-3') of Actin gene were used. 8 µL PCR grade water and 1X SYBER Green (ABI) in a total volume 20 µL. The reaction was set for 40 cycles with the conditions: initial denaturation 95°C 10 min, denaturation 95°C for 15 s, annealing 62°C for 15 s and elongation 72ºC for 45 s. After completion of cycling process, samples were subjected for melting analysis by following conditions as 95°C 15 s, 60°C for 15 s and 95°C for 15 s. The PCR reaction was carried out in triplicate for each gene. At the end of PCR, the melting curve application was run to determine the presences of any primer –dimer artifacts or co-amplified nonspecific product. In order to omit the sampling differences such as RNA quality, normalization was carried out with housekeeping actin gene.

Estimation of amplification efficiency

The standard curve was constructed based on the procedure[38]. Tenfold serial dilution series of cDNA with PAI-1 and TGF-β1 gene specific primers ranging from 50 to 3.125 ng reaction was used to construct the standard curve for TGF-β1 gene and PAI-1 gene. For the generation of standard curve for the housekeeping gene, actin five different concentrations of the first strand cDNA were used. PCR efficiency (E) was calculated according to the equation E= 10[(-(-1)/slope)] -1. Relative quantitative PCR reactions were performed whereby amplification of PAI-1 gene and TGF-β1 gene was normalized with housekeeping actin gene. The relative expression was level of TGF-β1 gene and PAI-1 gene in HALE treated was measured by taking untreated control samples as the calibrator.

Animal model studies

Efficacy of HALE in rat excision wound model

The wound model studies were done at Central Animal Facility, Karnataka College of Pharmacy, Bangalore. Female Wistar rats (200-250 g) used for the study was procured from NIMHANS Bangalore, Karnataka. Ethical clearance for performing the experiments on animals was obtained from the Institutional Animal Ethics Committee (IAEC). The animals were acclimatized for ten days under laboratory conditions and maintained at 27±2°C with a relative humidity of 65±7.5% under 12 h light/dark cycle. The animals were fed with rodent pellet diet (Gold Mohur Lipton India Ltd.) and water *ad libitum*. The animals were grouped in to three categories: Gr. I, the untreated control; Gr. II, standard drug soframycin treated; and Gr. III, HALE treated. The animals were anaesthetized prior to and during creation of wounds. Excision wounds were inflicted by cutting away 500 mm^2 full thicknesses along the marking on the depilated back 5 cm away from the ears. Animals in Gr. I were not given any treatment. Gr. II animal wounds were treated with 2% w/v soframycin (Himedia, India) and for Gr. III, the wounds were treated with HLAE (100 µg/1 mL) dose for 10 days. The wounded area was left undressed and

exposed to its environment. The degree of wound closure was studied and measured on 4th day and 10th day. Histological analysis was done to analyze the newly formed epidermis layer, collagen content, period of re-epithelization and inflammatory changes that occurred during the early post wound period, confirmed the depth of wounds and examined the pathological changes and the rate of recovery.

Statistical analysis

All the experiments were done in triplicate reactions. The whole data was statistically evaluated for determining the mean, standard deviation and the standard error. The results of the excision wound model are expressed as mean ± S.D from n=6 rats in each group. The significance of difference among the groups was assessed using one-way analysis of variance (ANOVA) followed by Tukey's test compared between normal control (Untreated) *vs*. all groups $P < 0.05$ were considered significant.

Results

Anti-inflammatory effect of HALE

The anti-inflammatory property of HALE was analyzed by three means— HRBC membrane stabilization, albumin denaturation, and inhibition of protein denaturation. Under the treatment of HALE with human RBC (HRBC) showed the suppression of hemolysis i.e. the rupture of RBC cells or erythrocytes. Table 1 shows the percentage of inhibition of hemolysis of RBC by the effect of HALE compared with the control drug aspirin. The inhibitory effect of HALE in rupturing the erythrocytes is evident from the data indicating its effect in keeping the stability of RBC membrane. Since the activation of wound inflammation has a coordination with the denaturation of protein especially albumin, the inhibitory effect of albumin denaturation and proteinase was estimated colorimetrically using HALE. The data showed high percentage of inhibiting albumin denaturation in the presence of HALE similar to the effect of the standard drug (Table 1). The inhibition of proteinase, the key enzyme of protein denaturation was also measured by using trypsin as enzyme in presence of HALE (Table 1).

Table 1 — Anti-inflammatory and antioxidant activity using HALE

	Cont. (aspirin 100 µg) (%)	HALE 100 (µg) (%)
Inhibition of hemolysis	60.945±0.947	34.975±0.708
Inhibition of albumin denaturation	96.92± 0.536	91±3.33
Inhibition of proteinase activity	33.4±0.432	21.5±0.543
Scavenging of DPPH		65.90±6.432
Scavenging of NOX		39±0.449

Antioxidant activity

The antioxidant activity of HALE was evaluated by DPPH and NOX free radical scavenging assay. Both the assay value exhibits the scavenging potency at the level of 35% and 65% for NOX and DPPH respectively. Table 1 displays the free radical scavenging potential of HALE using DPPH and NOX. The nitric oxide generated from SNP reacts with oxygen to form nitrite. As an anti-oxidant, HALE donate protons to the nitrite radical and a decrease in OD value was observed. The decreased absorbance was taken to measure the nitrite radical scavenging potency.

Cell viability

The effect of HALE in inducing viability and proliferation of cells was estimated by MTT assay using cell line cultures of 3T3-L1 and L6 cells. Under the treatment of HALE, both the cells showed a higher percentage of cell survival ability 97% in 3T3L1 and 95% in L6, respectively) indicating the level of active proliferation of cells.

***In vitro* scratch wound closure by HALE**

The effect of HALE was examined in scratch wounds created in cell culture monolayers of 3T3-L1 fibroblast and L6 pre-myoblast cells. The detached cells were removed from the scratch area and the wounds were made intact prior to the treatment of HALE. The wounded monolayers were treated with lower (10 µg) and higher concentration of HALE (100 µg) and incubated. The histomorphological changes of the wound were monitored for two days and documented under phase contrast microscope. An active tendency of cell proliferation and migration of cells was observed in the scratch wounds treated with HALE leading to the closure of wounds. An increasing phase of cell migration and wound closure was seen in scratch wounds treated with higher concentration of HALE (Fig. 1). The untreated wounds i.e. without HALE, the cell migration occurred in a very slow pace (Fig. 2).

qPCR data of wound healing marker genes

Total RNA was isolated for scratch wound cells treated with HALE and from untreated wound cells of 3T3-L1 and L6 cell lines. Fig. 3A demonstrates the RNA isolated from the cells both test and control. The presence of two discrete bands as 28S rRNA and 18S rRNA indicates the purity of RNA. Aliquot of RNA from both the cell lines were subjected to cDNA synthesis using Poly T primers and cDNA was used

for the amplification of PAI-1 and TGF-β1 gene fragments, using the designed primers and quantified by qPCR. In the case of PAI-1 gene, a fragment of 191 bp was amplified for qPCR from the scratch wound model of cells (Fig. 3B). Similarly, a fragment size of 180 bp was amplified for TGF-β1 gene from both the cell lines (Fig. 3C).

Gene concentration of PAI-1 and TGF-β1 in 3T3-L1 and L6 cells

The concentration of marker genes PAI-1 and TGF-β1 was determined by absolute quantification using the standard curve of the purified gene fragments at the concentration range of 50-0.05 ng. The curve was highly linear R2 ^ 0 in the range tested by triplicate reaction. The slope of the curve was −3.237 and the amplification efficiency was determined form the slope as 1.04 for the PAI-1 gene, whereas the slope of the curve and the amplification efficiency was −3.264 and 1.02 for TGF-β1 (Fig. 4 A & B). With respect to the standard curve of the marker gene, concentration of PAI-1 and TGF-β1 was calculated. Fig. 5 A & B demonstrates the concentration of PAI-1 and TGF-β1 genes in cell line cultures treated with HALE at 10 µg and 100 µg. It is obvious from the assay data that the concentration of PAI-1 and TGF-β1 genes was more in HALE treated cells than the control untreated cells. Both the genes showed 2 to 3 fold increase by the effect of HALE indicating the functional role of PAI-1 and TGF-β1 genes in wound closure. Moreover, the concentration was found higher in treated cells with 100 µg HALE than 10 µg.

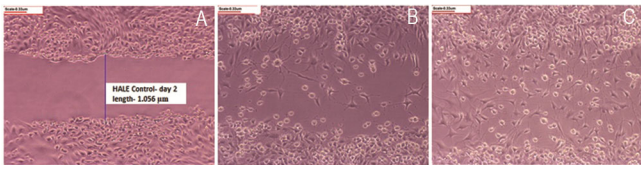

Fig. 1 — Wound healing of L6 myoblast cells after treatment with aqueous HALE extracts of *Hemigraphis alternata.* (A) 0 h; (B) 24 h of 10 µg; and (C) 24 h of 100 µg concentration.

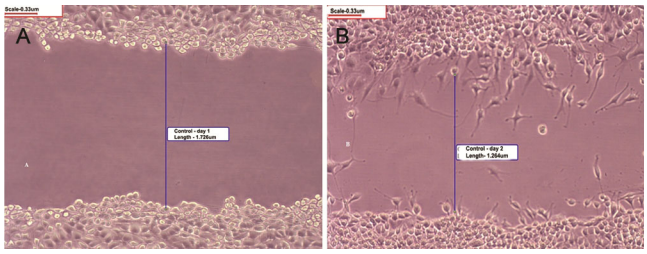

Fig. 2 — Control L6 cells after scratch wound. (A) 0 h; and (B) 24 h.

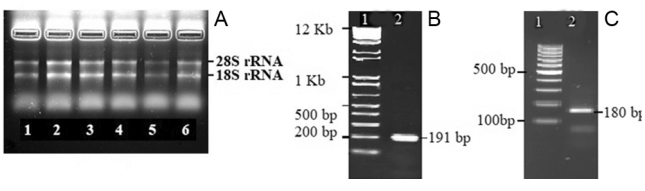

Fig. 3 — (A) RNA isolated from 3T3-L1 and L6 cell lines. Lane 1 and 2 control, lane 3and 4 HALE treated RNA from 3T3-L1, lane 4 and 6 HALE treated RNA from L6 cell lines; (B) PCR amplification of wound healing marker genes. a. Plasminogen Activator Inhibitor 1 (PAI-1) gene (191 bp) and from L6 myoblast. Lanes - 1: 12 Kb Molecular ladder, Lane 2: PAI-1 gene (191 bp); and (C) Transforming Growth factor β 1 gene (TGF-β1) gene (180 bp) from 3T3-L1 cells. Lanes - 1: 100 bp Molecular ladder, Lane 2: TGF-β1 gene (180 bp).

Expression fold of PAI-1 and TGF-β1 genes

Based on the variations observed in the gene concentration of PAI-1 and TGF-β1 related to the treatment of HALE in scratch wounds, the expression fold of both the genes was measured in cell line cultures treated with HALE. Relative quantification of the gene was done by qPCR using mouse Actin as the house keeping gene. A gene fragment of 180 bp was amplified (Fig. 6A). The expression fold of PAI-1 and TGF-β1 was calculated by normalizing with the house keeping gene actin using Realplex software. Fig. 6 B & C demonstrates the expression fold of PAI 1 and TGF-β1 in HALE treated wound cells. A clear demarcation was seen in the expression level of PAI-1 and TGF-β1 in HALE treated cells under lower (10 µg) and higher concentration (100 µg). The increased expression level of PAI-1 and TGF-β1 at higher concentration of HALE clearly matches with concentration of both the genes.

Effect of HALE in rat wound models

In the light of the biochemical and molecular data, on the effect of HALE in *in vitro* wound models, the study was extended to animal model using female

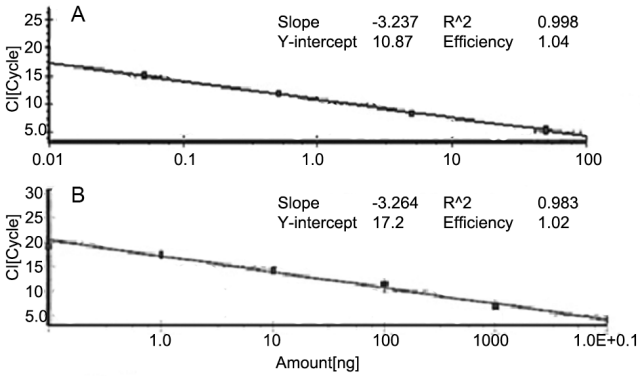

Fig. 4 — (A) Standard curve of PAI-1 gene using PCR eluted PAI-1 products; and (B) Standard of TGF- β1 gene (180 bp).

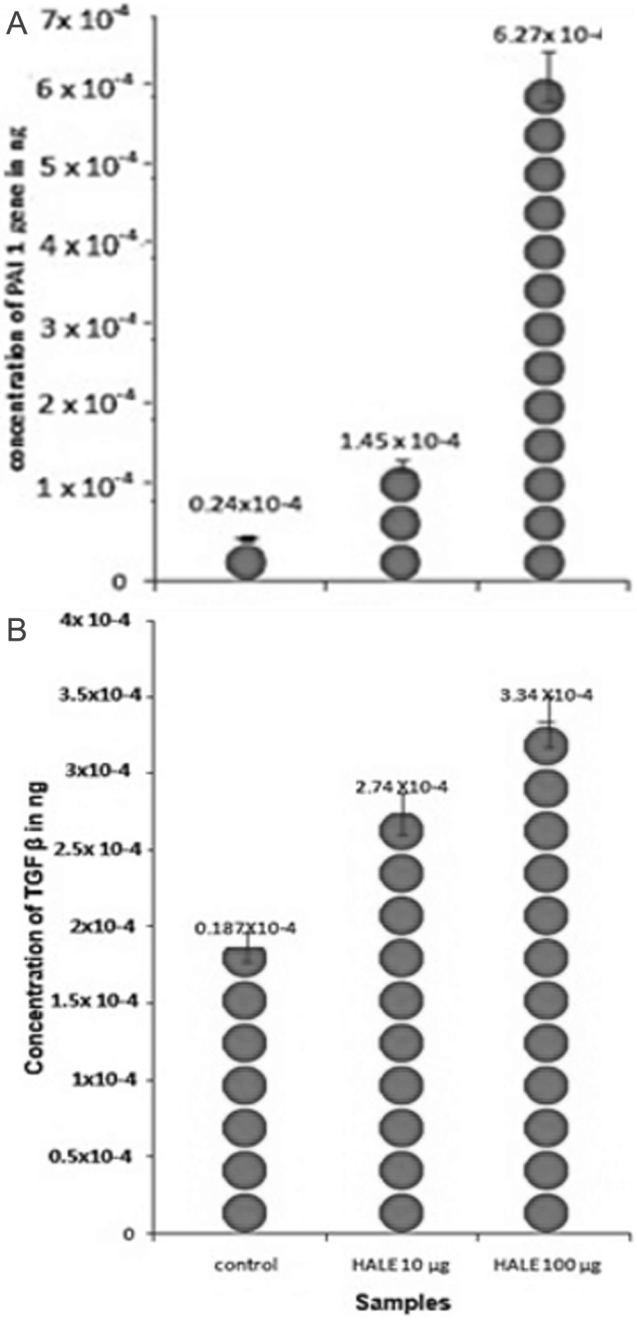

Fig. 5 — (A) Concentration of PAI-1 gene transcripts in cell line cultures treated with HALE at two concentrations of 10 µg/µL and 100 µg/µL; and (B) Concentration of TGF-β1 gene transcripts in cell line cultures treated with HALE in two concentrations of 10 µg and 100 µg.

Wister rats. The study was done in three groups of animals- normal HALE treated group and soframycin treated. Fig. 7 displays the effect of wound closure in excision wounds treated with HALE. A moderate level of wound closure was observed in HALE treated tissue compared to the standard drug soframycin

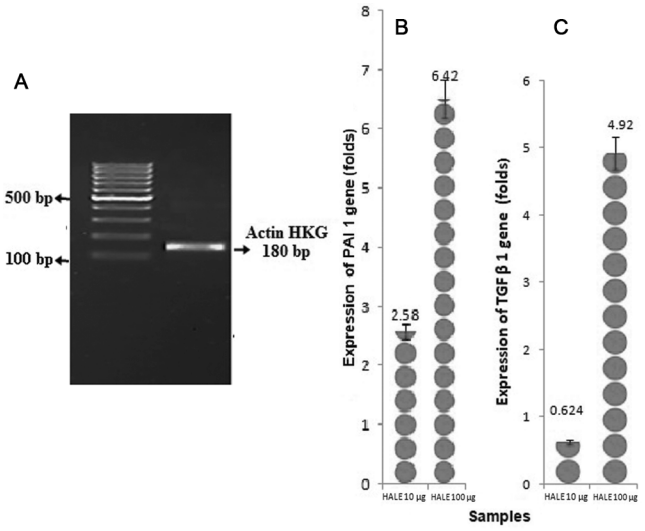

Fig. 6 — (A) PCR amplification of housekeeping gene Actin (180 bp) from cell lines. Lanes - 1: 100 bp Molecular ladder, Lane 2: Actin gene (180 bp); (B) Expression fold of PAI-1 gene transcript in cell line cultures treated HALE in concentrations of 10 µg/ µL and 100 µg/µL; and (C) Expression fold of TGF-β1 gene transcript in cell line cultures treated with HALE in concentration of 10 µg/ µL and 100 µg/µL.

(Fig. 7 A & B). Soframycin treated wounds exhibited maximum healing effect (Fig. 7 C & D). The active phase of wound closure for HALE treated showed 50% wound closure and the standard drug soframycin showed 70% closure of wounds. Histopathological analysis of the sacrificed animals provides strong indication of active wound contraction and epithelization of HALE treated wounds similar to the drug soframycin treated group. In wounds treated with HALE, epithelium formation was complete with more number of blood vessels and connective tissue than the untreated control (Fig. 8 A-C). A similar trend was seen in soframycin treated wound indicating the therapeutic effect of HALE as a wound healing drug. In control group, the wound contraction and epithelization was found in a slow pace.

Discussion

The pharmaceutical acceptance of the therapeutic property of folk medicines using modern analytical methods has become a research trend today for the development of herbal drugs. The data of the present study demonstrates the wound healing effect of the medicinal herb *Hemigraphis alternata* at biochemical and molecular level. Naturally in wounds, the inflammation was initiated by hemolysis of RBC membrane, thereby releasing the content in blood plasma. It was noticed that *H. alternata* leaf extract

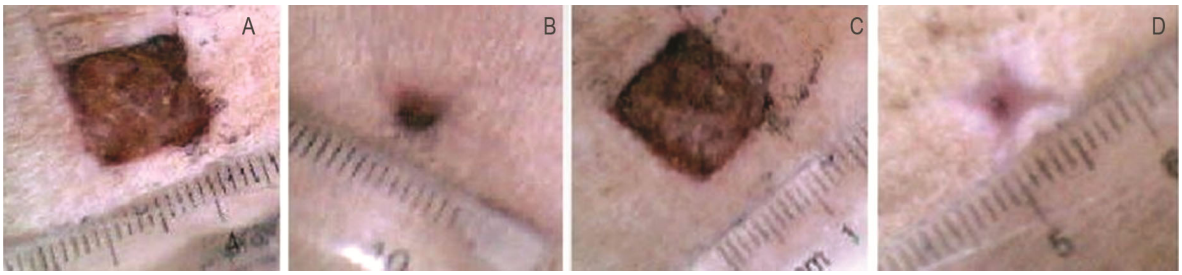

Fig. **7** — Rat wound closure on 4th and 10th day (A & B) in standard drug soframycin treated control group; and (C & D) in HALE extract treated group.

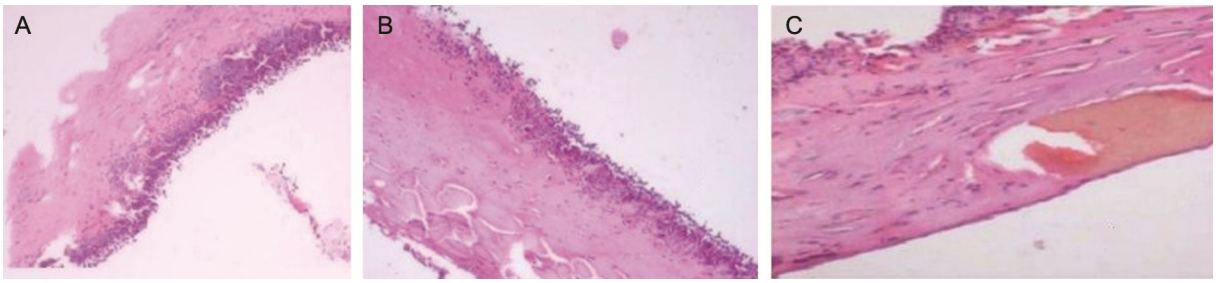

Fig. 8 — Histopathological studies on wound contraction and epithelization in excision rat wound model. (A) HALE extract treated (100 µg/1 mL) dose/10 days; (B) soframycin treated; and (C) Untreated control

(HALE) suppressed hemolysis by rupturing the RBC membrane supporting the anti-inflammatory property of HALE. Moreover, the ability of HALE to inhibit denaturation of albumin further supports its anti-inflammatory activity. The positive effect of HALE in proteinase inhibition reveals its capacity in preventing the denaturation of the protein which is essential for suppressing the infection. Thus, the stable nature of RBC membrane, inhibition of albumin denaturation and the inhibition of proteinase activity in the presence of HALE confirms the anti-inflammatory activity. Anti- oxidants normally help to control wound oxidative stress and there by accelerates wound healing[39,40]. Since molecular oxygen has a pertinent role in the therapy of wounds, the production of free radicals and other ROS by oxidation results in creating cytological effect for delayed wound healing[41]. Here, the presence of *H. alternata* leaf extract has induced the scavenging of free radicals and other ROS like H_2O_2 from the wound environment. Plants have several compounds with strong anti-oxidant activity that capture and neutralize free radicals[42]. In the case of molecular data, the active phase of proliferation and migration of cells during MTT assay using HALE showed the nontoxic nature of HALE. The triggering effect of HALE in healing the scratch wounds by cell multiplication and migration was evident from the *in vitro* cell line culture. Since the wound closure observed in scratch wound models indicates the healing effect by the treatment of HALE, the study was extended for determining the expression and concentration of marker genes of wound healing PAI-1 and TGF-β1 in cell line cultures treated with HALE. Subsequent to the cell migration and proliferation observed in the scratch wounds treated with HALE leading to wound closure, the concentration PAI-1 and TGF-β1 gene involved in wound healing was determined in the cells of the scratch wounds treated with HALE by absolute quantification assay using qPCR. This is for detecting the healing effect of HALE involved in wound closure at molecular level. A correlation was observed between the concentration and the expression level of both genes in HALE treated cells towards wound healing. As the marker gene of wound healing, it is well established that the TGF-β1 has many cellular responses like re-epithelization a prominent phase of wound healing process[43,44]. TGF-β1 is also seen to have efficient activity in process of angiogenesis, proliferation and production of extra cellular matrix during healing[45,46]. Similarly, the potential role of PAI-1, the serine protease inhibitor in suppressing the conversion of plasminogen activator (PA) to active plasmin which in turn activates fibrolysis and extracellular remodeling during wound healing[47,48]. PAI 1 is also

involved in cutaneous wound healing[49,50]. The qPCR data of absolute and relative quantification of PAI-1 and TGF-β1 showed the concentration and the expression fold of both the genes and it clearly indicates the molecular evidence of wound healing effect of HALE. Along with the *in vitro* cell line data, animal model experiments using HALE in excision wound model in rats have provided enough evidence of epithelialization, formation of blood vessels and connective tissues. Thus the biochemical and molecular results obviously confirm the healing efficacy of the medicinal herb *Hemigraphis alternata* and the data highlights the therapeutic merits of the plant beyond the level of a folk medicine.

Conclusion

The usage of folk medicines for curing human diseases has increased their market value in herbal industry. As a traditional medicine, the leaf extract of *Hemigraphis alternata* has been used for wound healing for decades. But the absence of proper scientific evidence for revealing the drug action of herbal medicine diminishes its wider acceptance in clinical therapy. Results of the present study at the molecular level substantiate the wound healing effect of *H. alternata*. The cell line data substantiates the drug action if *H. alternata* at molecular level in scratch wounds. The expression of the marker gene PAI1 and TGF-β1 quantified by qPCR highlights healing effect of *H. alternata*. Being a fast growing herb, it would be possible for exploiting the wound healing property of *H. alternate* for developing a herbal ointment in modern medicine. Hence further studies are warranted for developing a cost effective healing drug from this herb.

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Conflict of interest

The authors declare no conflicts of interest.

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The Impact of GST on Indian Industry in the View of Entrepreneurs: An Empirical Approach

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ABSTRACT

The introduction of the Goods and Service Tax (GST) was the igniting spark for the growth of India's economy by shifting the already prevalent forms of indirect taxation to the unregulated flow of different goods and services that were, without a doubt, very much needed. The cascading impact of taxes has been eradicated, rendering the accumulated figure a massive one for the Indian public. Our country has provided hope to ambitious growth objectives in the worldwide economic crisis, backed by strategic undertakings such as the Make in India and Digital India campaigns. Another such undertaking is the Goods and Services Tax (GST), which has supplied the much-needed amount. A stimulant for Indian economic development. The goal of this paper is emphasize the effects of GST on GST India's Technology Sector and how it affects the development of the economy of India. Being a Descriptive Research Review Plan, which is focused on secondary Data of GST, papers, Magazines and newspapers. Considering the goals of the descriptive style research design of the research study is adopted to have more precision and thorough research analysis. Primary GST data were collected primarily through direct administration of the questionnaire in order to identify the ranking. The study uses secondary GST to support and substantiate primary data and also to form a strong theoretical base. There was a need for a strong and systemic tax in the age of globalisation. Structure of competition at the international level for India. It is not just the GST that will carry the Transparency, but it will also enable ease-of-doing. Previously, each state used to have its own Tax rates were levied, which were complex and increased the price of the goods by cascading Effect that obstructs the international direct investment

INTRODUCTION

The introduction of the Goods and Service Tax (GST) was the igniting spark for the growth of India's economy by shifting the already prevalent forms of indirect taxation to the unregulated flow of different goods and services that were, without a doubt, very much needed. The cascading impact of taxes has been eradicated, rendering the accumulated figure a massive one for the Indian public.

Excise duty (medicinal and toilet preparations), Central Excise duty, Additional Duties of the Centre's taxes collected before July 1, 2017 include Excise (on textiles and their products), additional taxes, customs duties, service tax, and central surcharges. State taxes consist of State VAT, Entry Tax, CST, EAT (Entertainment and Cinematography), LT, PT, Activity Tax.

The only source of income for the Indian government is the collection of the tax, and the major source of the tax is indirect tax which is also known as GST, which defines “one tax one nation”. Before 1 July 2017 there were many state taxes imposed on the name on indirect tax like luxury tax, VAT tax, state tax, central tax, purchase tax, entry tax, entertainment tax, taxes on lottery, state cesses and surcharges, and the central taxes like central excise duty, service tax, special additional duty of custom etc are implemented. Imagine the tax burden on the payer and much calculation needed to be done to pay each tax. This created the situation of perplexity among the merchandisers. The introduction of GST has cleared the formation of indirect tax by introducing online filling of GST. The other main objective of GST was to remove the cascading effect, though many people argue that this objective has not been achieved yet. The cascading effect means “tax on tax” which coordinately increase the price of product hence lead to the inflation in the economy.

Research problem

Our country has provided hope to ambitious growth objectives in the worldwide economic crisis, backed by strategic undertakings such as the Make in India and Digital India campaigns. Another such undertaking is the Goods and Services Tax (GST), which has supplied the much-needed amount. A stimulant for Indian economic development. The goal of this paper is emphasize the effects of GST on GST India's Technology Sector and how it affects the development of the economy of India.

REVIEW OF LITERATURE

Impact of GST Industry wise approach

The justification for the onset of the goods and services tax (GST) The policy of 'one nation one tax' that our country abides by. It should be noted that it affects various sectors of the industry.

The development portion of the economy differs greatly. The first one the layer of variations that can be found in the deals with the industry with manufacturers, suppliers and retailers, or service providers

The implementation of many indirect taxes increased the amount of cash Investment by producers and manufacturers in administration Retailers. But with GST in order, the burden has to be met.

Slightly eased, enabling the industry to grow stronger. Nevertheless, because of the implementation of the same thing, companies Those who were not yet under the tax radar have to come out now. Record and file. This was an enormous factor in cutting

Kaur (2018) the purpose of study was point out the awareness among people about GST, and to find out the expectations of people after the implementation of GST. The study concluded that still people are not well aware about GST and due to lack of proper information they are having negative perception towards the act. It also shows the lack of goods and services information of the responded, not able to identify the slabs implemented. Chouhan et.al. (2017) the study focused on awareness of 148 small business owners in Rajasthan state. It also revel the problems faced by the small business owner due to lack of adequate knowledge and reliefs provided in the act. The major problems were that customer refuse to pay GST, which create a problem while submitting the taxation, other problem arises due to the inclusion of technology in the process has created the perception of difficult tax among the responded. The levels of awareness of the responded were low and moderate and majorly not willing to support the act. Bank and Das (2017) The study revealed the challenges to be faced by India Economy after the implication of GST, it throw light on the comparison of GST with previews Tax system, there were 31 taxes including sales tax, state tax etc, which are now turned into CGST, IGST, SGST making tax structure more complicated. The inclusion of technology in filling the GST has made the need to add trained employee for this purpose. The change in GST rate made the small venders and businessman more confused about the act. The study conclude that GDP will fall down due to the introduction of unplanned tax system thus its needed to more simplification in the act.

The Vendors.

CAIT has leanings towards the Sangh Parivar, and had carried out campaigns to boycott Chinese goods along with Swedish Jagran Manch. We held a three-day traders meet at Nagpur attended by over 300 trade association leaders. One of them was Pradeep Singhal, who heads the transporters guild. It was decided that traders will go on a one-day strike on February 26. Even Singhal announced they would bring transport to a halt, stopping all deliveries for a day. The very next day we got a message from the government, said BC Bhartia, national president of CAIT. It has been decided to hold another round of talks in first week of March. The real talks will happen if representatives of ministry of finance come. CBDT and CBIC are mere executing agencies, he said on political affiliation, Bhatia said CAIT is purely a traders association. Some months ago, CAIT had thanked Prime Minister Narendra Modi at a public function in New Delhi for bringing trade-friendly amendments. Now, CAIT has called for the countrywide trade bandh on February 26 against GST, calling it a very complicated tax that has made the lives of traders miserable.

They want the central government to immediately simplify it. Bhartia said the Centre introduced GST to make taxation system simple. However, since its introduction 900 changes have been made, which has made GST the most complicated tax in the world. Moreover, GST officers continue to come to traders establishments with warrants and scrutinize records for hours during peak business hours. The government talk about faceless tax system is all rubbish, he told TOI. Bhartia spoke specifically of two notifications of December 2020 and January 2021, which were detrimental to traders as they restrict a businessman from filing returns and deprive him of input tax credit (ITC), and also his number can be suspended

without show cause notice. He also noted there is no provision for claim of ITC after six months from end of the year. Right to claim ITC should not be restricted by time, said Bhartia. CAIT is also opposed to amendment to Section 129(1) (a), which enhances penalty from 100% to 200% for releasing detained or seized goods. Other amendments would also punish mistakes by traders in figures in returns.

Kumar (2017) The study analyzed the previous Indirect tax system and GST, briefly explained the complete concept of the GST, its rate and its comparison with the previous tax structure, the present GST system has removed many hurdles while filling the taxation. The examples provide more clarification on how GST is levied on the goods and how it is reducing the burden on small venders and businessman. The study concludes that the GST is easier than earlier tax system; it will provide more benefit to the manufactures and thus increase the competition in market. Mishra (2018) The study provided glimpse of the rates. It throw glance on the impact of GST, on pharmacy, agriculture, textile, mobile and accessories, telecommunication sector, real state, FMCG, automobiles, banking, financing.

The research paper concludes that the implication of single tax system will attract more manufactures to get engage in the sector. The individuals will also get benefit as the prices of the products will decrees and consumption will increase which will lead to the increase in GDP. Increased GDP will attract the foreign investment which will directly or indirectly create the employment opportunity. Kumar and Sarkar (2016) The study described the history of GST from International to National level. It also provided brief analysis of previous and present taxation system, and its other supplementary taxes with facts and figures. The facts presented in the study shows that how the GST is beneficial to customers, industries, exporters, and the Economy. The study conclude that GST should be implemented as soon as possible as delay in the implication may delay may provide negative impact in the economy.

Bhuyan and Nayak (2017) The study accommodated the various advantages of implementing GST, says removing of cascading effect, increasing the efficiency of logistics, regulating the unorganized sector etc. The paper on the basis of facts and figures shows the impact of GST on telecom, cement, banking and insurance, airlines, E-commerce, FMCG, technology sectors. The study conclude that the GST will provide the positive impact on economy and will increase the growth of GDP, and will generate the employment, but it will show the negative impact on the service sector as the rates of GST in the service sector has increased. GST will bring innovation, accountability, and transparence in the tax structure. A considerable share of IT sector in India today comprises the ‘start-up or incubator industry.

With the limits for registration lifted higher, a Do It Yourself model of compliance, tax credit on purchases and an unrestricted flow of various goods and services, the GST regime truly suited for Indian startups. Earlier, multiple states had different laws for VAT which led to immense confusion for companies which had a pan-India presence, particularly the ecommerce sector as it spans the whole nation. But GST has brought an end to all such practices.

From the literatures it is clear that GST is an emerging issue for the research in the subject of economy. At Macro level many study have been conducted but at micro level and semi urban area still no research is carried out. Keeping in view, the study attempts to identify the level of awareness and impact of GST among the small business owners in the Ernakulum city of Kerala

RESEARCH METHODOLOGY

Being a Descriptive Research Review Plan, which is focused on secondary Data of GST, papers, Magazines and newspapers. Considering the goals of the descriptive style research design of the research study is adopted to have more precision and thorough research analysis. Primary GST were collected primarily through direct administration of the questionnaire in order to identify the ranking. The study uses secondary data to support and substantiate primary data and also to form a strong theoretical base.

ANALYSIS AND DISCUSSION

After the Goods and Services Tax (GST) was implemented in our Country, India, a major change could be seen in the prices of products and services offered by the IT Sector. It is important to study GST effect in this sector because it comprises a huge part of the GDP. It is no secret that GST implementation has simplified the tax system in India by eliminating the many indirect taxes and establishing the single GST, thereby removing the cascading of various taxes. The garrett ranking was calculated using the CMIE GST collect which includes a details report on GST impact in numbers. Further analysis showed a ranking profile of these companies.

Table shows the Ranking on Impact of GST on industry wise

Rank Scale (x)	I	II	III	IV	V	VI	VII	VIII	IX	Total respondents	Total Score	Mean score	Rank
Factors	80	69	62	56	50	44	38	31	19				
Print publication	13	29	16	24	21	28	24	22	26				
	1040	2001	992	1344	1050	1232	912	682	494	203	9747	48.01478	8
Electronic Gadgets	26	26	29	24	17	10	24	25	22				
	2080	1794	1798	1344	850	440	912	775	418	203	10411	51.28571	3
Farm equipment	28	20	23	16	11	32	21	24	28				
	2240	1380	1426	896	550	1408	798	744	532	203	9974	49.133	7
Industrial goods	20	18	14	30	23	17	25	27	29				
	1600	1242	868	1680	1150	748	950	837	551	203	9626	47.41872	9
Media & News	22	27	17	19	22	29	21	21	25				
	1760	1863	1054	1064	1100	1276	798	651	475	203	10041	49.46305	6
Industrial Vehicles	22	23	24	19	24	28	23	22	18				
	1760	1587	1488	1064	1200	1232	874	682	342	203	10229	50.38916	4
Commercial Vehicles	33	16	25	25	27	19	17	27	14				
	2640	1104	1550	1400	1350	836	646	837	266	203	10629	52.35961	1
Oil & gas	18	19	34	35	22	16	21	24	14				
	1440	1311	2108	1960	1100	704	798	744	266	203	10431	51.38424	2
Food and Beverages	21	22	24	14	33	24	27	11	27				
	1680	1518	1488	784	1650	1056	1026	341	513	203	10056	49.53695	5
Total	203	200	206	206	200	203	203	203	203				

The GST of sources of information on impact. From the obtained mean values, the highest mean value obtained factor has been given the rank of 1 and the lowest is 8.In order to apply Garrett ranking each factor has been ranked by the respondents between the ordinal values of 1 and 9.

From the obtained mean values, it is understood that commercial vehicle was ranked as one with the mean value of (51.53), Oil & Gas (51.46) was chosen by the Data as second source and Customer (51.12) was the third choice by the Data. Industrial Vehicles(50.74) was ranked as fourth by the Data. Food & beverages (50.12) was considered as fifth source for the respondents. From the mean score of 49.97, Media News was the sixth source for the respondents. The Data have considered Farm equipment (49.57) as seventh source for respondents. Print publications (48.72) were chosen by the Data as eighth rank. Eventually industrial goods (45.72) was considered ninth factor by the Data.

CONCLUSION

There was a need for a strong and systemic tax in the age of globalisation. Structure of competition at the international level for India. It is not just the GST that will carry the Transparency, but it will also enable ease-of-doing. Previously, each state used to have its own Tax rates were levied, which were complex and increased the price of the goods by cascading Effect that obstructs the international direct investment.

The data were well in the sample, Awareness of the GST Act and the prices applied to the goods, but the small business. They were not really happy with the price requirements. The recent online tax filing ordinance has saved Most of the time and reduced paper work that reacted to it was appreciated. Sixty-two percent of the respondents accepted that corruption has been minimized due to the implementation of GST in India.

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