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# **A STUDY ON DATA ANALYTICS – FINANCIAL MODELING USING 3 STATEMENT MODEL AND DCF VALUATION - SIEMENS**

*Dr CMA M V Alagesan, Associate Professor, Acharya Bangalore B School, Bangalore, Karnataka.*

## **ABSTRACT**

*Financial statements reflect the position of a company in respect of its wealth and profitability in the short term and long term existence of the company. The company's result in terms of profitability is reflected in Profit and Loss statement for a financial year. The Long term financial health of the company in terms of its wealth creation will be reflected in its Financial Position Statement termed as Balance sheet reflecting its assets and liability position over the period of its existence. Various financial modeling techniques are used to predict the future of a company. The 3 statement model predicts the financial strength of the company for the future in respect of Balance sheet, profit and Loss Account and Cash flow statement. The study aims to achieve to predict the financial statements for future period of 5 years based on the past performance of the company. The study was based on the financial performance of Siemens AG for the past five years and it attempts to predict the future 5 years of the company under study.*

**KEYWORDS: Balance Sheet, Profit and Loss Account, Cash Flow Statement, Financial Modeling, 3 Statement Financial Model.**

## **INTRODUCTION**

### **1.1 Financial Modeling**

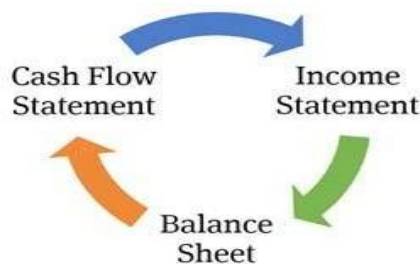
A financial model is a numerical representation of a company's past, present, and future business operations. This numerical report is expressed through the use of Accounting—the language of business. Finance, which may be broadly defined as the science of managing money and other assets, is based on accounting. As such, it is critical to realize the major role Accounting or the tallying of business transactions, plays in building financial models.

A financial model is a required component of nearly any business plan. Anyone interested in starting a new business, starting a new line of business within an existing company, assessing the operations of an existing or proposed business, and/or comparing the operations of two or more businesses, among other tasks, should know how to build, use, and modify a financial model.

Three Statement and DCF Model is used to build and forecast the financial statements to determine the financial position of a company as a whole in terms of Statement of Financial Position, Statement of Financial, Statement of Profit and Loss and other Comprehensive Income and Cash flow statement. All the calculation in the model is done by using MS EXCEL and also there is a trend analysis on the performance of the company.

### Three Statement Model

**Figure 1: Representation of three statement model**



### REVIEW OF LITERATURE:

Chanappiyachoomjai (2020), Discounted Cash Flow Valuation of Haad Thip Public Company Limited, in this paper they have applied the discounted cash flow valuation method (DCF method) to model the intrinsic value of HaadThip Company by prediction of the predictable cash flows and using net present value to discount those cash flows, taking the time value of money into attention.

Carlos. J.O and Jada. M.Thompson (2020), Discounted Cash Flow Valuation of Conventional and Cage-Free Production Investments, they compare profitability and risk of conventional and cage-free egg production in the United States. Assessing cage-free making is predominantly related given ongoing consumer determined changes and new cage-free legislation. Richard G. Barker (2014), The role of dividends in valuation models used by analysts and fund managers, here the value of a share is given by the dividend discount model as a modest purpose of future dividends; but the actual purpose of the share price is rarely based upon the direct estimation of these future dividends. Amiya Kumar Sahu (2014), Valuation: Hero Moto Corp Limited by using DCF model here we will learn how to evaluate the performance of the Hero Moto Corp Ltd by using DCF information and also with other information. Paul Pignataro (2013), FINANCIAL MODELLING AND VALUATION - A Practical Guide to Investment Banking and Private Equity, the book sets out to give any investor the fundamental tools to help to regulate if a stock investment is a rational one; if a stock price is undervalued, overvalued, or appropriately valued.

These essential tools are used by investment banks, private equity firms, and Wall Street analysts. Chandan Sengupta n.d.(2013), FINANCIAL MODELLING - Using Excel and VBA, here they have taught us how to learn and practice financial modeling the right way and to provide us with a extensive variety of real-world financial models—over 75 of them—to imitate and use for practice so that you can be on your way to financial modeling's Carnegie Hall. Pantelies Longinidis (2010), Integration of financial statement analysis in the optimal design of supply chain networks under demand uncertainty, In this article they have told that the models that intention to enhance the design of supply chain networks have become a mainstream in the supply chain literature. Daniel Z. Meyer (2009), Excel as a Qualitative Data Analysis Tool, Qualitative research seeks to examine the interconnections in rich, complex data sources. The statistical tools of quantitative methods isolate out the pieces of data in a manner that defeats the purpose.

#### **RESEARCH METHODOLOGY:**

##### **OBJECTIVES OF THE STUDY:**

- To undertake the trend analysis of the company's performance.
- To forecast the financial performance of the company for future period using Financial Modeling tools.
- To Value the business based on DCF technique.

##### **DATA FOR STUDY:**

In this study secondary data is used for data analysis. The information analyzed through the secondary data is very qualitative in nature. Therefore the information of the Siemens AG is taken into consideration and for analysis 4 year's data is taken. Historical data has been collected for the years 2016 to 2019, and the forecasting has been done for 5 years i.e 2020-2024. The trends in the movement of various parameters over the period of years are studied and certain inferences are made.

##### **LIMITATION OF THE STUDY:**

- The study is based on assumptions to predict the future.
- The outcome of the result is based on terminal value assumed to calculate the present value of a business.

## DATA ANALYSIS AND INTERPRETATION

### Analysis 4.1 Calculation of Income Statement

In the below table there is an historical data and a forecasted value of Income Statement.

**TABLE 4.1 CALCULATION FROM REVENUE TO NET INCOME IN INCOME STATEMENT**

<b>INCOME STATEMENT</b>									
<i>Fiscal year</i>	2016A	2017A	2018A	2019A	2020E	2021E	2022E	2023E	2024E
<i>Fiscal year end date</i>	9-30-16	9-30-17	9-30-18	9-30-19	9-30-20	9-30-21	9-30-22	9-30-23	9-30-24
<i>(€ mm except per share)</i>									
<i>Sales/Turnover/ Revenue</i>	79,644	82,863	83,044	86,849	1,00,297	1,21,326	1,60,901	2,12,361	2,95,569
<i>Cost of Sales (enter as -ve)</i>	-55,826	-57,820	-58,181	-60,922	-70,208	-84,928	-112,630	-1,48,652	2,06,898
<i>Gross Profit</i>	23,818	25,043	24,863	25,927	30,089	36,398	48,270	63,708	5,02,467
<i>Research and development (enter as -ve)</i>	-4,732	-5,164	-5,558	-5,670	-6,368	-7,826	-10,467	-13,715	-19,037
<i>Selling, general and administrative (enter as -ve)</i>	-11,669	-12,360	-12,941	-13,345	-15,174	-18,501	-24,669	-32,425	-45,058
<i>Other operating Income</i>	328	647	500	442	-404	-524	-649	-846	1,209
<i>Other operating Expenses (enter as -ve)</i>	-427	-595	-678	-466	-280	-354	-463	-578	-4,734
<i>Income from Investments</i>	134	43	-3	199	-7	-8	-11	-19	-22
<i>Operating Profit (EBIT)</i>	7,452	7,614	6,183	7,087	7,856	9,186	12,012	16,126	23,646
<i>Interest income</i>	1,314	1,490	1,481	1,634	1,816	2,200	2,930	3,835	5,911
<i>Interest expenses(enter as -ve)</i>	-989	-1,051	-1,089	-1,129	-1,294	-1,572	-2,078	-2,738	-2,956
<i>Other financial income/(expenses)</i>	-373	135	1,475	-74	552	785	587	1,013	1,389
<i>Pretax Profit</i>	7,404	8,188	8,050	7,518	8,930	10,598	13,450	18,235	27,990
<i>Taxes (enter expenses as -ve)</i>	-2,008	-2,148	-2,054	-1,872	-2,006	-2,427	-3,218	-4,247	-5,911
<i>Net income from continued operation</i>	5,396	6,040	5,996	5,646	6,924	8,172	10,232	13,988	22,078
<i>-attribute to non controlling interests</i>	-134	-133	-313	-474	-314	-423	-637	-851	-1,078
<i>- attribute to share holders</i>	5,450	5,960	5,807	5,175	6,723	7,848	9,735	13,289	21,262
<i>Income for Discontinued Operation, net of taxes</i>	188	53	124	3	114	100	140	152	262
<i>Net income</i>	5,584	6,093	6,120	5,649	7,037	8,272	10,372	14,140	22,340

The formula used for the particular financial activities are:

Gross Profit = (Sales + Cost of sales)

EBIT = Total sum of (R&D, Selling general and administrative, other operating income, other operating expenses and income from investments) in that particular year.

Pretax Profit = Sum of (Interest income + Interest expenses + other financial income/ (expenses))

Net Income = (Net income from continued operation + income from discontinued operation, net of taxes)

## **INTERPRETATION**

To analyze the income statement there are two types of analyses they are:

1. Vertical analysis
2. Horizontal analysis

For this study vertical analysis has been used, and the information that has been projected is that gross profit of a company will be of 30% throughout the projected years as well as in the previous years. EBIT in the income statement has been increased year by year which means there is a less expenses on mortgages, payrolls, property taxes etc which indicates the profitability of a company. At the end of the income statement there is a Net Income values which have been increased year by year which indicates the good sign for a company's profitability. Companies with reliable and cumulative net income over time are looked at very positively by stockholders. Therefore, Siemens is looking at very favorably by stockholders.

## **ANALYSIS 4.2 CALCULATION OF BALANCE SHEET**

Let us understand the Balance sheet items which are influencing the performance of the company.

**TABLE 4.2 BALANCE SHEET FROM CASH AND EQUIVALENT TO TOTAL ASSET**

<b>BALANCE SHEET</b>									
<b>Fiscal year</b>	<b>2016A</b>	<b>2017A</b>	<b>2018A</b>	<b>2019A</b>	<b>2020E</b>	<b>2021E</b>	<b>2022E</b>	<b>2023E</b>	<b>2024E</b>
<b>Fiscal year end date</b>	<b>9-30-16</b>	<b>9-30-17</b>	<b>9-30-</b>	<b>9-30-19</b>	<b>9-30-20</b>	<b>9-30-21</b>	<b>9-30-22</b>	<b>9-30-23</b>	<b>9-30-24</b>
<i>(€ mm except per share)</i>									
<i>Cash and equivalents</i>	10,604	8,375	11,066	12,391	28,005	44,431	77,490	1,19,206	1,83,867
<i>Available for sales securities</i>	1,293	1,242	1,286	NA	NA	NA	NA	NA	NA
<i>Accounts receivables</i>	16,287	16,754	17,918	18,894	19,884	24,104	31,843	41,580	58,421
<i>Inventory</i>	18,160	13,885	13,885	14,806	17,403	19,647	25,849	34,176	48,550
<i>Deferred tax assets</i>	3,431	2,283	2,341	3,174	3,174	3,174	3,174	3,174	3,174
<i>Other current assets</i>	8,004	17,911	19,312	22,938	22,938	22,938	22,938	22,938	22,938
<i>Property, plant and equipment and intangible Assets</i>	17,899	21,903	21,512	21,983	43,515	45,759	51,961	60,288	74,662
<i>Goodwill</i>	24,159	27,906	28,344	30,160	30,160	30,160	30,160	30,160	30,160
<i>Investments using Equity method</i>	3,011	2,727	2,579	2,244	2,591	3,135	4,157	5,487	7,637
<i>Current Income Tax assets</i>	790	1,098	1,010	1,103	1,103	1,103	1,103	1,103	1,103
<i>Assets classified as held for disposal</i>	190	1,484	94	238	238	238	238	238	238
<i>Other assets</i>	21,889	20,543	19,568	22,317	22,317	22,317	22,317	22,317	22,317
<i>Total assets</i>	1,25,717	1,36,111	1,38,915	1,50,248	1,91,329	2,17,006	2,71,230	3,40,666	4,53,066

**INTERPRETATION**

In the above table the cash and equivalent has been increased which means that higher liquidity. A company with higher liquidity considered as healthier and poses less of a risk. The company will also receive a lower interest rate as it mentions in the income statement. Available for sales securities values is not given in the 2019 because of which the projected year is also not considered the values. Deferred taxes represent taxes that must be paid at a future date. Paying in advance to generate deferred tax assets can support a business looking to decrease their tax liability in a future period. By considering above explanation in the calculation the deferred tax has been taken as constant value. The amount that company has to be paid in future is taken as constant. The total asset has been increased from 8% to 41% which signifies that the company is growing.



**TABLE 4.3 CALCULATION OF CASH FLOW STATEMENT**

CASH FLOW STATEMENT									
<i>Fiscal year</i>	<i>2016A</i>	<i>2017A</i>	<i>2018A</i>	<i>2019A</i>	<i>2020E</i>	<i>2021E</i>	<i>2022E</i>		
<i>Fiscal year end date</i>	<i>9-30-16</i>	<i>9-30-17</i>	<i>9-30-18</i>	<i>9-30-19</i>	<i>9-30-20</i>	<i>9-30-21</i>	<i>9-30-22</i>	<i>9-30-23</i>	<i>9-30-24</i>
<i>(€ mm except per share)</i>									
<i>Net income</i>					7037	8272	10372	14140	22340
<i>Depreciation and amortization</i>					3641	4135	5040	5953	7931
<i>(income) / Loss related to investing activities</i>					-713	-798	-915	-696	-781
<i>Working Capital</i>									
<i>Accounts receivable</i>					990	4,220	7,739	9,738	16,841
<i>inventory</i>					2,597	2,244	6,202	8,326	14,374
<i>Accounts payable</i>					-83	2,845	4,599	5,659	9,666
<i>Other asset</i>					0	0	0	0	0
<i>Cash from operating activities - CFO</i>					13,469	20,918	33,037	43,120	70,371
<i>Additions to intangible assets and property, plant and equipment</i>					-2,939	-3,632	-4,852	-6,341	-8,812
<i>Cash from investing activities - CFI</i>					-2,939	-3,632	-4,852	-6,341	-8,812
<i>Purchase of treasury shares</i>					0	0	0	0	0
<i>Issuances of long term debt</i>					5,366	5,382	4,988	5,552	5,322
<i>Repayment of long term debt (including current maturities of long term debt)</i>					0	0	0	0	0
<i>Change in short term debt and other financing activities</i>					-6034	0	0	0	0
<i>Dividends paid to shareholders of Siemens AG</i>					-3551	-4170	-5296	-7286	-11363
<i>Other liabilities</i>					330	330	330	330	330
<i>Cash from Financing activities - CFF</i>					2,145	1,542	22	-1,404	-5,711
<i>Changes in cash and cash equivalents</i>					15,614	22,460	33,059	41,716	64,661
<i>Cash and cash equivalents at beginning of period</i>					12,391	28,005	44,431	77,490	1,19,206
<i>Cash and cash equivalent at end of period</i>					28,005	44,431	77,490	1,19,206	1,83,867

## INTERPRETATION

In the above table there is Cash from operating activity (CFO) which explains the sources and uses of cash from ongoing regular business activities in a given period. When cash from operating activity increases it indicates that the core business activities of the Siemens AG is thriving. It provides as additional indicator of profitability potential of a company. Cash from investing activity (CFI) in the above table is in negative cash flow which indicates that the Siemens AG company spent amount on purchase of fixed assets or purchase of investment instrument, such as stocks and bonds. Negative cash flow from investing activities might be due to important amounts of cash being invested in the long-term health of the company, such as research and development. Cash from financing activity (CFF) shows the net flows of cash that are used to the fund the company.

The financial activity includes debt, equity and dividends. In the above table the financial activity section is showing low and negative amount which means that the Siemens AG company will be paying their debt in time where investors may not worry about the ability of the company to pay back the debt. From the explanation and calculation, the cash and equivalent that has been predicted for projected years is good which indicates the better performance of the company.

### *ANALYSIS 4.4. CALCULATION OF DCF MODEL*

*Table 4.4.1 Calculation of Equity*

Unlevered FCF	15,877	20,924	21,047	21,428	22,817	24,995	3,45,822
NPV Cash Flow			19,133	17,709	17,142	17,072	2,14,728
Firm Value (NPV)	2,85,785						
NPV Value of the Firm	2,85,785						
Plus: Cash	1,83,867						
Less: Debt	57,024						
Equity Value	₹ 4,12,628						

## INTERPRETATION

In the above table the NPV (Net Present Value) is positive in all the years which means the cash inflow for the company is good. As there is no negative value in the Net present value the investors are no need to worry about there investments, therefore the equity of the company is

positive which indicates that investors can invest their amount on the Siemens AG for the future projects which will ensure the investor to get back their investments intime. If we reconsider the Discount rate assumptions the profitability of the investors might increase, because of which there is a sensitivity calculation isdone.

**TABLE 4.4.2 CALCULATION OF SENSITIVITY ANALYSIS**

		Discount Rate				
	4,12,628	8%	9%	10%	11%	12%
	7	3,72,075	3,62,706	3,53,808	3,45,355	3,37,318
	8	3,93,566	3,83,228	3,73,415	3,64,094	3,55,236
	9	4,15,056	4,03,751	3,93,021	3,82,833	3,73,153
Exit Multiple	10	4,36,547	4,24,273	4,12,628	4,01,572	3,91,070
	11	4,58,037	4,44,796	4,32,234	4,20,311	4,08,988
	12	4,79,527	4,65,318	4,51,841	4,39,050	4,26,905
	13	5,01,018	4,85,841	4,71,447	4,57,789	4,44,822

## INTERPRETATION

Sensitivity analysis is a financial model that determines how to target variables are affected based on changes in other variables known as input variables. This model is also referred to as what-if or simulation analysis. It is a way to predict the outcome of a decision given certain range of variables.

## FINDINGS, SUGGESTIONS AND CONCLUSION

### FINDINGS:

- In the study the revenue growth is assumed as 100% and based on that the gross profit is calculated.
- Gross profit is considered as 30% throughout the year. That is in historical year as well as in projected year.
- The Net Income of the company is increasing year by year which is the good sign for the profitability of the company.
- The EPS of the company is found that there is an increase in the value and has reached around 80 which is the good significance for the growth.

- It is found that the segment revenues have equally contributed for the overall revenue values which plays very important role in the performance of the company.
- In trend analysis the sales and net profit goes hand in hand. As sales increases the net profit also increases.
- It is found that the company is credit worthy.
- It is also found that the company has effective business strategy by seeing the equity value.
- In DCF Model it is found that there is a positive cash flow in all the years. In the exit year the unleveraged cash flow and NPV is positive.
- In sensitive analysis it is found that the WACC and Exit Multiple should be selected according to the value of the NPV.

## **SUGGESTIONS**

- To improve the overall revenue growth the company has to concentrate on wind power and renewable segment as it is contributing little less comparative to other segments.
- If the company has to increase its EPS, the company has to expand their margin rates by lowering costs. They can also utilize share buybacks; this means that they lower the number of shares that can be bought without making any alterations to profits. This in turn raises the EPS.
- If the restructure the liabilities, the amount of liabilities can also be reduced. The restructuring of liabilities can be done by agreeing longer or scheduled payment term with suppliers, or replace existing loans with guaranteed loans or consolidated loans or by shareholder funds.
- In DCF it is found that there is a positive NPV in all the years. Those values can be improved by increasing the discount rate, the deeper the cash flows get discounted and the lower the NPV. The lower the discount rate, the less discounting, the better the project or the business.

## CONCLUSION

From the study it can be understood that in the segment revenue growth, the energy management has stopped to contribute to the total revenue of the company. The wind power and renewable energy are contributing little less compare to the other segments. The company has maintained assets liability match which gives creditworthiness to the company. The company pays back their debt, long-term loan within the given time. As per the outcome of the study the Siemens AG financial performance in future year will be better and investors can invest on this company with no worry as the NPV values are positive which indicates there will be a return to the investors in proper time.

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# **INFRASTRUCTURE AND INFRASTRUCTURAL FACILITIES STATUS OF INDIAN MULTI MODAL TRANSPORTATION SECTORS IN MARINE TRADE –AN ANALYTICAL STUDY**

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## **ABSTRACT**

*Shipping industry is one of the most globalized industries that is far more liberalized than the other industry in this highly competitive market. This peculiar structure of the industry throws both Opportunity as well as challenges as it opens the global markets for Indian Shipping companies, while at the same time exposing them to global Competition even on their home based pasture. The main benefits of containerization can accrue with the setting up of Internal Container Depots (ICDs) and Container Freight Stations (CFSs) which will come into existence only if there is adequate freight being generated in the specific area. In this connection, it is desirable to establish a single authority for planning, development, implementation and enforcement of the policies will helpful to developing the infrastructure and infrastructural facilities of multimodal transport sector in marine trade in near future for compete the world shipping market by Indian global traders.*

**KEYWORDS: ICD, CFS, Containerization, infrastructure, infrastructural facilities and multi modal transport sector.**

## **PREAMBLE OF THE STUDY**

In Indian shipping industry has lot of procedure in multimodal transport and containerization we will going to see about regarding that in very general terms combined or multimodal transport means two or more transport modes were linked under a contractual arrangement. There is always a possibility to focus on the law of individual mode and to treat with another mode as an incident and such a link is put forth as discussion. The required service for the an agent such as shipping or forwarding agent only, the linking of past modes is provided through the service for customers not for creating link for the wish of themselves. In order to prepare themselves on such role the alternative model carriers or their agents can be carried on. The induction of container technology and introduction of multimodal's have made the development of a network ICDs and CFSs at important hinterland centre's inevitable for providing various services and facilities to the exporters and importers. The Asian economy is

one of the most dynamic in the world due to high degree of industrialization programs assisted by foreign investment which manufacturing capabilities and stimulated local demand.

## **INFRASTRUCTURE**

The three most important criterions for success in International Trade are Price, Quality and In Time delivery. It is not possible to meet these criterions without having a proper logistics and multimodal system. Containerization and multimodal transport form an integral part of any logistics and supply chain. The quality of product is improved by discovering innovative methods by simultaneously lowering the cost of product. One of the important methods of lowering the costs is by lowering inventory levels and introducing just in time concepts. Thus Indian merchandise cannot become competitive without containerization and multimodal transport. Compete with world shipping industry market, India also needs to develop a suitable logistic system for economical and efficient transportation of goods from the manufacturing centers to the distribution points. It has been estimated that logistics costs including inventory, insurance and documentation aggregate to about 20% of the final costs of the products and any inefficiencies and inadequacies have a negative impact on export competitiveness. India exports about 21 million tones of general cargo of which 9 million is containerized thus leaving scope for further containerization.

## **OBJECTIVES OF THE STUDY**

The researcher has framed objectives of this present study is connected with an analysis of infrastructure and infrastructural facilities of Indian multi modal transportation sector in Marine trade as a study through secondary data as a desk research.

## **NEED FOR THE STUDY**

This present study is concentrated towards find out the factors influencing the multi modal transportation's infrastructure and infrastructural facilities namely road and rail in Indian marine industry perspectives. Meanwhile, the role of private sectors for improving the existing infrastructure and infrastructural facilities of Indians sea ports for overcome challenges in the global shipping industry with rendering effective, efficient and quality services towards sea port users for export and import their goods and services for improving the Indian economy as well as

increase the Indians foreign exchange reserve position through offering best services towards the business community those who are involving with domestic and international business. Therefore, this present study will show case the present scenario of India's multi modal transportation position for understanding and improving the infrastructure and infrastructural facilities of India's multi modal sectors in marine industry.

## **RESEARCH METHODOLOGY**

The researcher has collected published data related to multi modal transport sectors data for constructing this present study.

## **CHALLENGES OF THE STUDY**

The researcher has felt that identify and analyze the critical role of containerization in the growth of marine trade, identify and analyze the obstacles to the development of multimodal transport sectors in Indian perspectives and ascertain the role of multimodal transport in the future growth of infrastructure and infrastructural facilities in marine trade.

## **OVERVIEW OF MULTIMODAL TRANSPORT FACILITIES STATUS IN INDIA**

On the basis of multimodal transport the international multimodal transport carry the goods by at least two different modes of transport from a place in one country at which the goods are taken in charge by the multimodal transport operator to a place selected for delivery located in a different country. It has progressed, though, to have numerous meanings closely connected to multimodal transport, and these various definitions will be revised in turn. The most common is that the goods are carried from door to door in the same intermodal transport unit (ITU), The intermodal transport unit (ITU) is the way by which the goods are carried from door to door usually a container, but its can also swap bodies or piggyback trailers. This is called intermodal transport by ECE, ECMT and the EC, as well as the International Container and Intermodal Transport Bureau (ICB) and the International Chamber of Commerce (ICC).

## **INTERMODAL TRANSPORT**

The movement of goods in one and the same loading unit or road vehicle, which uses successively two or more modes of transport without handling the goods themselves in changing



modes.

## **MULTI MODAL TRANSPORT SYSTEM**

The co-ordinated use of two or more modes of transport for speedy, safe, pleasant and comfortable movement of passengers in urban areas was explored by Multi Modal Transportation System (MMTS). From the place of origin to destination this model provides convenient as well as economical connection of various mode to make complete journey. Generally, MMTS has been categorized by amplified capacity, competent access and improved location of both integration and nodes. Public transport is an significant essential of multi-modal transportation system and hence local and regional public transportation system must be as integral part of the similar.



**Figure 1: Various Stages of multimodal transport Project Development**

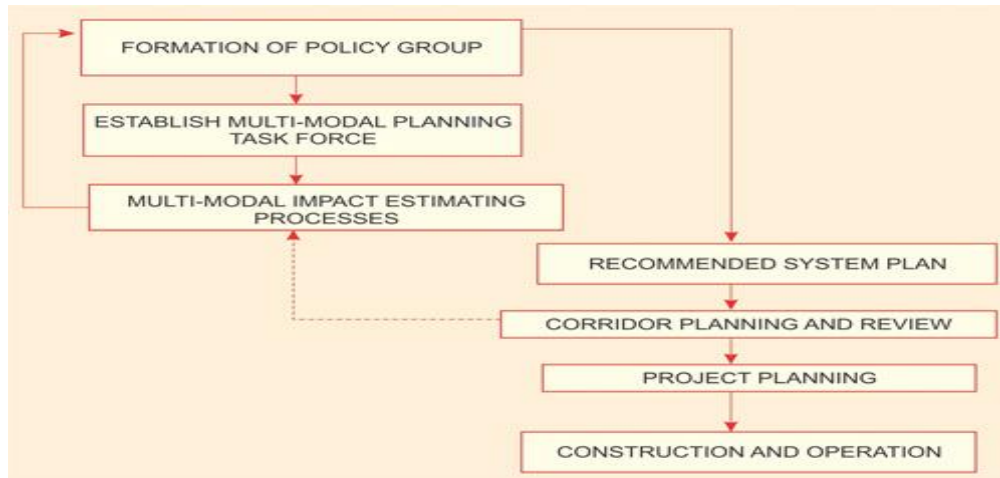
## **RAIL BASED MODES**

Metro Rail Corridor-Ring Rail-Light Rail Transit-Mono Rail-Integrated Rail cum Bus Transit, etc.

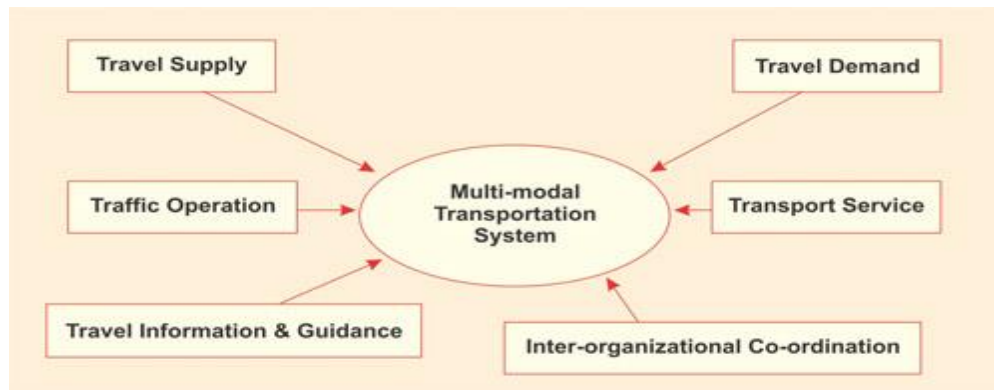
## **ROAD BASED MODES**

Regular Buses-Mini Buses-Double Decker Buses-Articulated Buses-Express Buses-Trolley Buses-Guided Buses and Battery Operated Buses.

The planning and building of Multi-modal Transport System can be illustrated as follows:



**Figure 2: Process of Planning and Building of Multi-modal Transport System**



**Figure 3: Components of Multi Modal Transportation System**

## **ROLE OF CUSTOMS IN MULTIMODAL TRANSPORT SECTORS**

With the advent of containerization in India, Indian customs became an important entity in the transportation chain. New systems and procedures had to be put in place and constantly tuned fine to adapt with the frequently changing scenario. As customs duties on export/import goods are a major source of revenue for the Government of India the procedures instituted had to prevent revenue leakage on one hand and not becoming cumbersome to delay trade growth on the other hand. At this point one can say that the custom authorities have succeeded to a great extent in achieving these objectives. The custom procedures can be broadly divided in to three areas: a) Export cargo procedures, b) Import cargo procedures, c) Trans shipment cargo procedures.

## **DATA ANALYSIS:**

### **GROWTH OF CONTAINERIZATION AND GLOBAL MULTIMODAL OPERATORS**

<b>YEAR</b>	<b>GDP IN BILLION RUPEES</b>	<b>MILLION IN TEUs</b>
2006	17844	4.451
2007	18959	5.016
2008	20144	5.652
2009	21403	6.368
2010	22741	7.176
2011	24162	8.086
2012	25672	9.111
2013	27277	10.266
2014	28982	11.568
2015	30793	13.035
2016	32718	14.688
2017	34763	16.550
2018	36935	18.648
2019	39244	21.013
2020	41696	23.677
2021	53254	27.44

**Source: Indian port analysis 2021**

### **OBSERVATIONS OF THE STUDY**

According to the various reports from different sources like World Bank, International Monetary Fund, Asian Development Bank and the Ministry of Finance the GDP of India is projected to grow at a rate of 6-8% in the next ten years. Will reflect other sectors like container penetration, trade intensity, foreign direct investment, rising income levels will also have a strong impact on the growth of containerization. Taking into consideration all these factors it will be reasonable to forecast that the throughput will grow at a rate of 13-14% in the next 3-4 years and will then stagnate around 12% for another 3-4 years and then gradually reduce and stabilize at 9-10%. Thus the container quantity will raise from the current 4-5 Million TEUs to

20 Million TEUs by 2020. However the Government of India does not have the necessary resources required to invest in the development of infrastructure. According to the evaluations of the Ministry of Economic Affairs at least USD 150 Billion are required in the next ten years to develop world class infrastructure.

## **RECOMMENDATIONS OF THE STUDY**

In India multimodal transport and containerization is increasing rapidly but it is not satisfactory when compared with foreign countries. International multimodal transport includes water, road, rail and air modes of transport in which 85% to 90% of the goods transport is done by sea, so the sea dominates international multimodal transport. In India multimodal transport lacks infrastructure facilities. It has only few ICD's near the cargo rail station. Its needs to establish more hinterland container depots well connected with rail tracks. Taking into consideration the expected growth in the coming years, it is imperative for the country to develop the necessary infrastructure. The capacity of the Ports, Roads and Railways need to be augmented immediately. Road transport is improving, the Golden Quadrilateral highway network connecting India's four largest metropolises: Delhi, Mumbai, Chennai and Kolkata, another network connecting Bangalore, Pune, Ahmedabad, and Surat, is also served. All the road lines must connect well the trade centers and ports. Improving the accuracy and timeliness of shipping documents will help to ship sooner and clear customs much more quickly. Accuracy of shipping documents decrease processing time and ease border clearance. The technology improvements viz Internet, e-mail to move documents, Radio-frequency identification (RFID) a technology that uses communication through the use of radio waves to exchange data -serve customers better, faster, requiring less manpower to follow up. Despite the continued expansion of international multimodal transport, there is no international uniform liability regime in force to date. The present regime comprises a complex mix of international conventions designed to regulate unimodal carriage - diverse and often conflicting regional, sub-regional and national laws and regulations, and standard-term contracts. Indian railways is not developed enough the government must put in more effort to make railways more freight-friendly, more dedicated freight corridors have to be set up. Infrastructure development requires huge investments. There is no alternative but to invite the private sector to invest in the development. But the private sector will do only if there are guaranteed assured returns on capital invested.

Proper pricing of infrastructure is for attracting private investments. There is also a need to develop a suitable logistic system for economical and efficient transportation of goods from the manufacturing centers to the distribution points. Infrastructure has to be properly priced to enable it to sustain itself on one hand and also generate reasonable profit on the capital deployed in constructing it. At the same time it should also be affordable to the end user. Awareness must be created on the importance of developing seamless infrastructure for multimodal transport, otherwise the potential of Indian foreign trade cannot be realized. The Government of India has to accelerate the pace of reforms which should be progressive, facilitative and encourage investment. This will result in transformation of markets which will result in growth and availability of clusters of private participation. Technical knowhow needs to be imported from developed countries who have the necessary experience of running such a complex industry whose performance has a bearing on the overall development of the country

## **CONCLUSION OF THE STUDY**

Multi-modal Transport System (MMTS) explores the use of multiple modes of transport for safe, convenient and efficient movement of passengers. Generally, MMTS has been characterized by increased capacity, efficient access and better location of both interchange and integration nodes. Additionally, presence of MMTS in metro region enhances accessibility, economic growth, public health, environmental protection, security & safety, social cohesion, etc. In this connection, it is desirable to establish a single authority for planning, development, implementation and enforcement of the policies will helpful to developing the infrastructure and infrastructural facilities of multimodal transport sector in marine trade in near future for compete the world shipping market by Indian global traders.

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## **A STUDY ON “THE IMPACT OF ONLINE SHOPPING UPON RETAIL STORES”**

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### **ABSTRACT:**

*This paper is an attempt to highlight the impact of the increasing trend of online shopping over the various fixed shop retailers. Retailers comprise group of middle men facilitating the breaking bulk quantities and sell it in small quantities to retail customers<sup>1</sup>. The entry of e-stores is providing multiple choice of products with attractive incentives which in greatly affecting the retail business in off line mode. This study is intended to understand the various ways in which retail businesses are being affected. It is also aimed to know various recovery mechanisms adopted by the retailers to encounter such problems. This study is an attempt to enlighten the retailers to face current scenario and work proactively.*

**Keywords: E-stores, Retail outlets, On line shopping, Retail Strategies.**

### **INTRODUCTION:**

The growth of technology facilitates the seller in reaching the customer in faster, easier and in cost effective way. The emergence of online shopping has greatly influenced the profit margin and turnover of retail outlets<sup>2</sup>. Now a day the internet holds the attention of retail market. The invention of the internet has created a new system shopping over traditional. Many customers like to experience shopping and go for purchasing from retail outlets. Still many consumers prefer offline shopping; some are using both mode of shopping. The focus of the study is to find out the impact of shift in buying behaviour on retail stores. There is a huge shift in online shopping, since it is easier and very faster to access the information and make choice among wide varieties. The consumers now have two choices whether to purchase through online shopping or offline. Consumer should decide the channel for them which can best suit to their need and wants and which can satisfy them. In this scenario the retail outlets need to understand the changing consumer behaviour and frame suitable strategies to retain their regular customers.

## **INTRODUCTION TO ONLINE SHOPPING:**

Online shopping allows the consumers to directly buy goods or services from a seller over the Internet using a web browser. Consumers visit various websites through search engine and buy the products of their choice without delay and they can easily access various sites through computers, laptops, tablets and smart phones. Now there are many online retail stores which are coming up with large variety of products through various channels of distribution<sup>4</sup>. Flipkart, Snapdeal, Jabong, Myntra, Amazon are some of the leading online shopping websites currently in India. Internet makes our purchase very simple and satisfied. Purchases are made simple by reaching the target customers event in their hands through mobile phones. Websites and applications provide visual feast to the customers and thereby influence them to buy the products. Retailing is a service offered to the customers in accessing the products nearer to them at affordable price and at required quantity. The retail outlet is fixed at a place where it operates by selling variety of goods and at retail quantities to the nearby or floating customers. It may be small or big which deals same line of operations. The retail stores may be in the form of departmental stores, exclusive show rooms, discount stores, super market, Kirana store, organized malls, and unorganized malls. Indians will be purchasing through on line than any other people in another 10 to 15 years. In 2020 e-commerce sales were about \$16 billion, according to Morgan Stanley. Such sales are expected to grow faster in India than in any other market. This has attracted a flood of investment in e-commerce firms, the impact of which may go far beyond just displacing offline retail.

Purchasing products or services over the Internet, online shopping has attained immense popularity in recent mainly because people find it comfortable to shop from home or office and also eased from the trouble of moving from shop to shop in search of the good of choice.

Online shopping allows consumers to directly buy goods and services over the internet through virtual mode. The leading online stores in India are Amazon, Flipkart, Snapdeal, Homeshop18, Myntra etc.

Retail is a process of breaking the bulk and providing the service of convenience and comfort in availing the products or services<sup>5</sup>. Retail stores may be small or big but they mostly operate in the same line as “purchasing to sale”. Retail is the oldest form of business since



civilization and is the basic form for any business. Types of Retail Stores are like-

**Departmental Stores** - A department store offers wide range of products to the end-users under one roof. In a department store, the consumers can get all the products required for day to day living.

**Discount Stores** - Discount stores offer a wide range of products to the consumers at a discounted rate. The discount stores deal with limited number of items and the quality in certain cases might be a little inferior.

**Supermarket** – A type of retail store where they sell food products and household items which are properly arranged in specific section is called a supermarket. A supermarket is a grown up form of the small grocery stores and kirana stores.

#### **CHARACTERISTICS OF ONLINE SHOPPING:**

The following are some characteristics of online shopping are as follows;

It is a store which operates through internet } Customer wide variety of choices of various brands

It works through online payments through debit cards, credit cards, cash on delivery,

It has flexible timings it operates 24/7.

This shopping has terms and conditions and certain policies against return and refund.

This involves shipping cost or it may be added to the cost of the product

This include various suppliers of different locations

#### **GROWTH OF ONLINE SHOPPING/RETAILING:**

The Indian retail industry is the fastest growing among all the sectors in the world. India is mentioned as the fifth largest retail destination around the world. According to Google, India have more than 100 million internet users out of which 50% of the users do shop online and the percentage is increasing every year. With large size, many companies from the retail shops to consumable goods are entering the web and attracting large number of customers. The Indians are accepting online retail in a large way. There is 100% annual growth in online shopping registration a, many retail companies and FMCG companies are joining the web to hit the e

shopping market. The online shopping industry is growing faster in cities and also in rural. The increase in the number of sellers from foreign and private has boosted the Indian retail sector. The price consciousness in the Indian customers makes the difference and is focused while deciding on strategies. The global retailers are sourcing from India. Online sales continue to grow in spite of the pandemic and recession in the economy. Consumers are adopting online shopping which has minimized the difficulties of shopping since free delivery of goods and service are also becoming more attractive in on line. The Government of India also established many reforms to attract the foreign direct investment in retail sector. They approved 51% in multi brand retailing and 100% in single brand retail.

### **METHODOLOGY:**

This study is descriptive in nature. The researcher adopted secondary sources like text books, journals, websites, and articles. The objectives of the study is to assess the online shopping for its impact on retailers, to analyze the advantages and disadvantages over online shopping to customers, and review strategies to be taken by the retailers to improve the business.. Fixed shop means a shop which sells their products by having a permanent physical existence .these shoppers so not have to move from one place to another place. This study also analyses the challenges in on line shopping.

### **CHARACTERISTICS OF FIXED SHOP RETAILERS:**

Fixed shop retailers have large scale of resources for products and services.

It deals with variety of products like consumer's durables and non-durable goods.

It has more credibility among the customers they offers various services to the customers.

### **CHALLENGES FACED BY FIXED SHOP RETAILERS:**

#### **REAL ESTATE COST:**

To establish a shop there is a need of land. But since land prices also increasing the retailers do not afford to buy the land to have their stores which affect them do their business. The rigid regulations of government are a big challenge to them.

**HIGH RENT:**

Many retailers who establish their shops in the malls have to spend more on rental expenses and other establishment expenses which could not afford if they could not generate adequate income.

**HIGH PERSONNEL COST:**

As fixed shop retailers have a physical shop they have recruit much human resource to sell their products and to handle the goods and services. It involves huge cost in terms of their salary and other benefits to the staffs who deal with sale of products.

**LACK OF BASIC INFRASTRUCTURE:**

The fixed shop retailers may suffer from basic infrastructural facilities. They are unable to get the resources if they do not have adequate fund. So many retailers go for shutdown.

**HIGH COMPETITION:**

Since there are many retailers available in the market, it is very difficult for Retailers to come up with different products to be unique and to cater the needs of large segmented market. Therefore because of this they may go for tie ups with other retailing companies.

**DECLINE IN FIXED SHOP/ OFFLINE RETAIL BUSINESS:**

Offline retailing is declining due the emergence of e commerce. Most of the customers visit the shopping malls after verification of details of availability, features, price and after some analysis on internet. So the customer who is going for retail shops have been declined over a period. According to the Google report we see many internet users and customers go for online even for consumable products. Retailers are facing many problems to have built the store due to raise in property price and land price. So the offline retailers finding more difficult to pay for rent. The following are the reasons for decline in offline retailing or fixed shop retailers.

**CUSTOMERS:**

The customers plays very important role in the market. The retailing business is declining due to the change in behaviour of consumers from buying fixed stores to online stores to purchase the products. The behaviour of consumers is changing day by day and mindset is also

changing very often. Consumers look for unique products from large variety of products through the online stores. Consumers compare the products through online where they get fashionable boutiques and all designers accessories<sup>7</sup>. This influences the offline stores to a greater extent in reduction of sales.

### **LARGE DEMAND OF VARIETY PRODUCTS AT ONE PLACE:**

Online retailing has rapidly grown since past several years. In 2015 the top e retailer Amazon 97% increase in their sales over a year. This is because of one click online experience. This allows the customers to place large varieties of orders just by clicking, without wasting their time in going outside and leaving busy schedules. It makes the customer stop going to the mall which leads to decline in sales of retail mart.

### **OVER PROMOTION:**

The offline retail may decline by making large promotional selling, this is because when they do more promotion it leads to decrease in price of the product by giving discounts and offers which makes the brand name as well as the quality down<sup>8</sup>. This may lead to negative behaviour among the customers and they may not prefer to go retail marts.

### **NEXT GEN SHOPPING:**

Due to the emergence of technology, the mindset of the consumers also upgraded and they expect new and latest products as and when it introduced into the market .this opportunity will not be available in the offline marts wherein they don't get the innovative products immediately as and when it is introduced it will take time and customer with no patience, they just don't wait till the products appears in to the mart. Even this may cause lots of problem in reduction in offline sales.

### **STRATEGIES ADOPTED BY OFFLINE RETAILERS TO IMPROVE SALES:**

Offline retailers are also upgrading their sites to be more visible in online and to trade and make their customer more convenient to purchase the products.

The offline retail sales could be improved by providing adequate information about the product, features, quality so that they feel happy and comfortable while shopping.

Retailers should develop certain new store formats in different locations to cater the needs of the customers.

Due to emergence of technology it is also any boon for the retail business to make virtual showrooms in their stores which can take them to a trip into the stores and the various products and so that they can easily make their decisions on purchase.

Pick up and drop points also can be implemented by the retailers' also the delivery of the products till the door facility should be improved.

### **BENEFITS OF ONLINE SHOPPING TO CONSUMERS:**

The consumer behavior is changing day by day drastically people not using the internet not only to book the tickets, recharge etc but now they also prefer to buy all consumable goods, electronics goods also without much hesitation. The following are the some of Advantages of online shopping they are as follows:

#### **MORE CONVENIENT:**

Online shopping is very convenient customer can buy any product as and when they want without much delay they can easily access the website and get the product which they wish to buy.

#### **OFFERS BETTER PRICES:**

Online shopping gives better deals and reasonable prices because products come directly from the manufacturer or seller without middlemen involved. Many online shops offer discount coupons and offers.

#### **LARGE VARIETY OF PRODUCTS:**

Online shopping offers several brands and products from different sellers at one place. Customers are able to get all fashionable or branded products without finding any difficulty and can shop with any retailers throughout the world.

#### **LESS EXPENSIVE:**

Usually people spend more than what is to be spent on goods because of travelling, having food outside.

#### **HELPS IN COMPARISON:**

Online shopping enables people to easily access product details and compare the choices available with multiple brands. It also provides lots of information and reviews about the

products so that people make correct decision while purchasing the product.

### **NO RUSH:**

If people want to buy any products they need not wait until someone responds it back there won't be any rush while shopping.

### **AVAILABILITY:**

Online shopping helps the customers to shop for any products from any locations throughout a day .It operates 24 /7. It enables the consumers to place any product any time .

### **DISADVANTAGES OF ONLINE SHOPPING:**

The following are the some drawbacks of online shopping are as follows:

#### **NO PHYSICAL EXPERIENCE:**

The products which the consumers buy through touch and feel experiences are not possible to buy through on line. The quality of products like textiles, clothing, furniture etc cannot be measured without having the contact of hands and ready garments cannot be measured for its fit without trails.

#### **SHIPPING COST:**

The cost of additional charges such shipping or delivery charges cannot be bargained by the buyers. This cost may likely to be same as how the others goods will be delivered to door steps when customers purchase fixed retail shops.

#### **COSTLY TO RETURN:**

The terms and conditions of purchasing a product and its return policy should be thoroughly understood by the consumers while buying a product through on line. Otherwise it will be very difficult for the customer to return their product if they do not like.

#### **WAIT:**

The waiting time to buy usual products is comparatively high in on line, where as they can buy instantly from a nearby shop if those products are available. The customers as soon as they place the order they will not get their product immediately.

#### **UNKNOWN VENDORS:**

The online shopping deals with many vendors around the globe, the customers may not aware of the sellers or the suppliers with whom they are dealing with. The selling company may or may not be reputed and the quality of their brand or their brand name will not be known to the

customers and they do not feel confidence upon the sellers when they go online purchases.

## **CHALLENGES IN ONLINE SHOPPING:**

### **AWARENESS OF SITES:**

Even though the number consumers using the internet but they do not know about certain online shopping portals which suits their needs to purchase their products according to their wish. Also they do not aware of which site is offering good quality products.

### **PAYMENT:**

Some customer fear making payment in advance. The delivery of goods may not be not be available in rural areas. So they prefer payment on delivery option.

### **RELIABILITY:**

Sometimes the products which are displayed on to the website and the product which they sell will be different that is why many customers do not have confidence on reliability.

### **DELAYED DELIVERY:**

The consumers have to wait for 3 to 4 days delivery time for the products they have ordered. Sometimes it will not be delivered on time when they need it.

### **DELAYED SERVICE:**

When the claim is been made towards replace or return or to refund the products, customers have to undergo some procedures to settle their claims.

### **DELIVERY CHARGES:**

Sometimes cost of the product will be less but when it includes certain shipment costs or packaging or handling charges it will be same cost as offline stores.

## **CONCLUSION:**

Thus with tremendous large population India is remarked for high growth potential. Growth of retailing sector mainly depends on consumer expenditure. The use of technology in both for fixed marts and online marts is very essential to expand their market share. It is necessary to all the sectors of retailers to consider their challenges to grow in the market. The fixed shop retailers must follow those strategies which are mentioned in the study in order to list themselves among the various competitive players. Whether it is through online or offline, India should grow in terms of its retail business and contributes still more towards GDP by creating trust, confidence

and satisfying various customers. This conceptual study helps to know about the online shopping or online retailing and it gives the some picture about how the purchasing pattern of the consumers shifted to online stores. It also highlights certain strategies to be followed by the fixed shop retailers to enhance their sales. So these Strategies may helpful for the retailers to increase their sales in coming years. As a result it can be concluded that, Companies involved in online retailing as well as fixed shop retail business should focus on building trustworthy relationship between producers and customers to improve the business which leads to economic growth.

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## UTILIZATION OF WORKING CAPITAL IN BPCL: A CASE STUDY

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### ABSTRACT

*At present in the commercial world, every enterprise has to maintain an adequate amount of working capital to meet its daily business needs. The working capital, being the life blood of the business, a study is necessary as to whether the working capital is properly utilized. Much efficiency is needed on the part of management to concentrate on the daily requirements of running the business. Otherwise, the business comes to standstill when the concern is not able to meet its unexpected demands posed in the competitive world. This paper concentrates on utilization of components of working capital in BPCL.*

**KEYWORDS: BPCL, Working Capital Utilization, Working Capital Index, Performance Index, Utilization Index, Efficiency Index**

### INTRODUCTION

Working capital utilization of BPCL is studied through the analysis of the components of working capital. For the survival of any business unit, it has to maintain its current assets and payment of current liabilities under proper control. If not, it may lead to the closure of the business unit and later the utilization of fixed assets also gets wind up. BPCL is taken for the study.

### STATEMENT OF THE PROBLEM

At present, in the competitive world, the oil and gas companies are facing the problem of shortage of raw materials, power and availability of finance to suit the urgent needs of the customer requirements. Such issues arise due to not properly not utilizing the working capital of the business. Hence, the present study is undertaken to find out whether the working capital is properly utilized or not by BPCL.

## **OBJECTIVES OF THE STUDY**

- (i) To find out the effective utilization of daily capital requirements of the business
- (ii) To offer recommendations and suggestions for the improvement of the working capital position of BPCL

## **METHODOLOGY**

The methodology adopted for the research helps to solve the problem undertaken during the study. The data for the research is taken from the annual reports of BPCL. The period of 10 years from 2011-2012 to 2020-2021 is taken for the research.

## **FRAMEWORK OF ANALYSIS**

The working capital is analysed through Working Capital Index which takes the forms of Utilization Index, Performance Index and Efficiency Index

## **SOURCE OF DATA**

The annual reports of BPCL is utilized for the data source, the secondary data for the research. The data is for the period from 2011-2012 to 2020-2021.

## **SCOPE OF THE STUDY**

The research is done for the study of the utilization of the working capital of BPCL. Various factors influencing the limit of working capital namely current ratio, debtor's ratio, inventory ratio are studied, whereas the present study can be extended to the coverage of oil and gas companies in private sector or particularly public sector. Further the study can also be extended to the study of the analysis of fixed assets position analysis in the oil and gas companies in the public sector. The study of the corporate social responsibility assumed by the Indian oil and gas companies can also be undertaken.

## **TOOLS FOR ANALYSIS**

The working capital index in the form of Performance Index (PI), Utilization Index (UI) denoted and Efficiency Index referred (EI)

### **PERFORMANCE INDEX (PI)**

The ratio between the changes in the sales and the rate of change in the current assets is termed as PI. The components of working capital are taken into account and it taken to the comparison of the sales.

### **UTILIZATION INDEX (UI)**

The UI expresses the level of utilization of the working capital during a particular year.

### **EFFICIENCY INDEX (EI)**

EI is the product of PI and UI

### **STRUCTURE MODEL:**

Utilization Index in Current Assets

As per the objectives, UI of the current assets of BPCL is calculated as per the formula given as under:

$$UI_{CA} = \frac{St}{St - 1} \times \frac{CA_{t-1}}{CA_t}$$

Where,  $UI_{CA}$  = Utilization Index for Current Assets

$St$  = Sales revenue at period 'T'

$CA$  = Current Assets at period 'T'

Other method:

$$UI \text{ of } CA = \frac{\text{Sales in the Current Year}}{\text{Sales in the Previous Year}} \times \frac{\text{Current Assets in the previous year}}{\text{Current Assets in the current year}}$$

If the utilization index is more than one ( $UI > 1$ ), then it is deduced that the current assets are properly utilized and vice versa.

### **PERFORMANCE INDEX:**

PI shows the effective utilization of current assets with reference to sales.. If the sales proportionately increase in relation to working capital, then it is understood that the concern is performing well and the current assets are properly supplied in order to meet the demand in sales.

If PI is more than one ( $PI > 1$ ), then it is understood that the working capital is properly utilized towards the supply of current assets necessary for day-to-day business activities and vice versa.

$$PI = \frac{\text{Sales in the Current Year}}{\text{Sales in the Previous Year}} \times \frac{\text{Working capital in the previous year}}{\text{Working capital in the current year}}$$

#### **EFFICIENCY INDEX:**

The product of both of UI and PI is referred as the Efficiency Index which studies the measure of the efficiency in the working capital management. If EI is greater than one ( $EI > 1$ ), then it is understood that there is an efficient management of the current assets and vice versa.

$$EI_{ECM} = UI_{WCM} \times PI_{WCM}$$

Where,

$UI_{WCM}$  = Utilization index in working capital management

$PI_{WCM}$  = Utilization index in working capital management

$EI_{ECM}$  = Efficiency index in working capital management

## RESULTS AND DISCUSSION

**TABLE – 1 COMPONENTS OF WORKING CAPITAL INDEX - BPCL (RS. IN CRS)**

VARIABLES	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Net Sales	232,545.12	284,382.95	297,275.05	236,421.41	202,210.57	189,303.33	238,086.90	260,060.53	240,115.75	211,972.97
TURNOVER INDEX (TI)	1.42	1.22	1.05	0.80	0.86	0.94	1.26	1.09	0.92	0.88
Current Assets	50,962.30	41,063.23	46,637.25	37,002.50	34,258.12	28,075.57	30,285.46	39,651.90	38,389.81	39,445.33
CA/SALES	0.22	0.14	0.16	0.16	0.17	0.15	0.13	0.15	0.16	0.19
UTILISATION INDEX (UI)	1.96	0.66	1.09	1.00	1.08	0.88	0.86	1.20	1.05	1.16
Inventories	26,756.75	20,421.06	21,544.65	20,874.57	19,798.01	13,696.28	14,457.85	19,071.13	16,690.37	15,948.06
Receivables	7,827.47	5,164.34	6,670.72	5,151.73	4,758.18	2,165.02	2,607.67	4,080.16	4,025.13	6,378.34
Cash and Bank Balance	7,053.49	115.78	95.41	182.53	64.69	2,067.35	1,360.20	203.76	2,328.86	978.85
Short Term Loans and advances	137.9	590.58	1,628.88	71.02	70.65	1,030.81	748.39	941.35	1,244.98	787.34
Index - Inventories	1.74	0.76	1.06	0.97	0.95	0.69	1.06	1.32	0.88	0.96
Index - Receivables	0.00	0.66	1.29	0.77	0.92	0.46	1.20	1.56	0.99	1.58
Index - Cash and Bank Balance	18.61	0.02	0.82	1.91	0.35	31.96	0.66	0.15	11.43	0.42
Index - Loans and advances	0.02	4.28	2.76	0.04	0.99	14.59	0.73	1.26	1.32	0.63
Total of the indices	20.37	5.72	5.93	3.70	3.22	47.69	3.64	4.29	14.61	3.59
Indices - Average	5.09	1.43	1.48	0.92	0.81	11.92	0.91	1.07	3.65	0.90
PERFORMANCE INDEX (PI)	7.25	1.75	1.55	0.74	0.69	11.16	1.15	1.17	3.37	0.79
EFFICIENCY INDEX (EI)	14.19	1.15	1.68	0.73	0.75	9.77	0.98	1.40	3.54	0.92

From the Table 1, it is inferred that inventories, receivables, cash and bank balances, loans and advances for short term form the components of working capital. Utilization Index is calculated which shows that there are normal fluctuations during the period from 2011 – 2021. During the study period, it is observed that during the initial period (2012) the utilization index was much better ( $1.96 > 1$ ). During the year 2013, it is found that the current assets are not properly utilized. From 2013, it started growing up to 1.00 in 2014 and increasing trend till 2016 which is inferred that the concern took adequate measures to utilize the working capital to finance the current assets so as to meet the demands of the customers. Again, BPCL faced a fall in 2017 & 2018. From there it started to raise in the following years of 2020 & 2021. In the year, 2021, the Index rate is 1.16 which is good position as it is greater than 1 ( $1.16 > 1$ ). But still BPCL has to take care to see that the working capital in the form of inventory, receivables, loans and advances for short term.

At the outset, it is observed from the study that BPCL has to take initiative in framing the credit terms and policies, raising of necessary short term loans which should be properly financed out of working capital.

From the Table 1, it is inferred that the performance index is less than 1 ( $PI < 1$ ) during the years 2015, 2016 & 2021. In these years, the components of working capital namely inventory, cash and cash equivalents, receivables, short term loans and advances are not properly managed during those periods. BPCL had not taken proper steps to plan the availability of inventory, minimum level and also buffer stock to meet the exigencies. Hence, the working capital got blocked during the years 2015, 2016 & 2021. Further due to outbreak of COVID19, the business at the global level suffered a great set back. Hence, BPCL has to still plan to effectively it revolving capital properly and carefully.

From the Table 2 it is inferred that on an average the Utilization Index (UI), Performance Index (PI) and Efficiency Index (EI) of BPCL showed that the index is greater than 1 ( $> 1$ ) during the ten years period implying that at the outset BPCL has utilized its working capital very effectively, but in the last year 2021, Efficiency index is less than one ( $EI < 1$ ) which implies that due to outbreak of pandemic disease, the inventory get stocked and rather the concern experienced a slow movement of stock. In the years of 2016 & 2017, BPCL should have a great cautious steps to overcome the movement of components of working capital and also on the utilization of its components.

**TABLE - 2****Working Capital Index Abstract – BPCL**

<b>YEAR</b>	<b>UI</b>	<b>PI</b>	<b>EI</b>
2012	1.96	7.25	14.19
2013	0.66	1.75	1.15
2014	1.09	1.55	1.68
2015	1.00	0.74	0.73
2016	1.08	0.69	0.75
2017	0.88	11.16	9.77
2018	0.86	1.15	0.98
2019	1.20	1.17	1.40
2020	1.05	3.37	3.54
2021	1.16	0.79	0.92
Average	1.09	2.96	3.51
Maximum	1.96	11.16	14.19
Minimum	0.66	0.69	0.73



**TABLE - 3**

**BPCL - LIQUIDITY ORDER OF THE WORKING CAPITAL COMPONENTS DURING  
THE PERIOD OF STUDY (IN PERCENTAGE)**

YE A R	Inventor y Compon ent to CA	Investme nt to CA	Trade Receivables to CA	Cash & Cash Equivale nt to CA	Short Term Loans & Advanc es to CA	Other Curr ent Asset s to CA	Liquidity Ranking						Tot al Ran ks	Ran k Over all
							1	2	3	4	5	6		
2012	13.33	52.50	15.36	13.84	0.27	4.69	4	8	9	10	3	1	35	6
2013	12.68	49.73	12.58	0.28	1.44	23.29	3	7	5	3	4	7	29	1
2014	10.88	46.20	14.30	0.20	3.49	24.92	1	3	8	2	9	9	32	3
2015	13.50	56.41	13.92	0.49	0.19	15.48	6	9	7	4	1	4	31	2
2016	15.65	57.79	13.89	0.19	0.21	12.28	8	10	6	1	2	2	29	1
2017	18.16	48.78	7.71	7.36	3.67	14.31	10	6	1	9	10	3	39	8
2018	16.80	47.74	8.61	4.49	2.47	19.88	9	4	2	7	7	5	34	5
2019	11.62	48.10	10.29	0.51	2.37	27.10	2	5	3	5	6	10	31	2
2020	13.44	43.48	10.48	6.07	3.24	23.29	5	2	4	8	8	6	33	4
2021	15.08	40.43	16.17	2.48	2.00	23.84	7	1	10	6	5	8	37	7
Average	14.12	49.12	12.33	3.59	1.94	18.91								
SD	2.28502111	5.366302433	2.897885676	4.478490427	1.361398458	7.038303								

From the Table 3, it is asserted that the liquidity position of BPCL is studied. The components of working capital is assigned with the ranks ranging from the years 2011 – 2021. It is found that in the year 2021 and 2017 liquidity position of BPCL as the components namely Inventory, short term investments, trade receivables, cash and cash equivalents and short term loans and advances have been properly contributed by the working capital efficiently and effectively, but during the years 2013 & 2016, the position was found to be very weak. Hence, at the outset, it is inferred that the BPCL is working from 2017 – 2021. Among the components, investment in Short term followed with the inventory contributed a lot towards building up of working capital.

From the Table – 4, it is found out that current ratio of BPCL on an average is 0.88 which implies that it is fair. On analysis of the Liquidity ratio position of BPCL it is assessed that the ratio found to be 0.45 on an average during the 10 years period from 2011-2021 which implies that is below the ideal ratio of 1:1. Hence the concern has to take steps to maintain the liquidity of the current assets through proper planning of inventory policies, trade policies regarding credit terms and payment/receipt of account receivables/payables.

From the study of Absolute liquid ratio of BPCL on an average, it is calculated as 0.71 nearing to the thumb rule of 1:1, but still it is although not in better position, it is in good position and further during the years 2014, 2016 & 2021 found to be better as it was able to realize the current assets quickly without loss of time value.

While analyzing the inventory position in relation to sales, it is found that the BPCL found to be weak in the years 2017 and 2018 only, but for the remaining years, it is found to be in a better position. Debtor's position of BPCL was found to be best during the years 2015 & 2016, 2013, 2014 & 2020. At the outset is found to be in a better position as it averaged out to 55.21.

Through the table it is revealed that the contribution of Current Assets to Total Assets is found be much better with an average of 0.16.

BPCL further averaged out to 7 days for debtor's collection period and 29 days on an average for inventory conversion. During the years of 2014 & 2015, the debtor's collection period was only 4 days which is a very favorable situation for BPCL and even its liquidity position got boosted during those years whereas in 2021, it is 12 days. Hence, the concern should still refine its credit terms and policies so as to retain its liquidity position

**TABLE - 4****STUDY OF LIQUIDITY POSITION OF BPCL THROUGH SELECT RATIOS**

<b>YEAR</b>	<b>CR</b>	<b>LR</b>	<b>ALR</b>	<b>ITR</b>	<b>DTR</b>	<b>CATA</b>	<b>CA to Total Sales</b>	<b>Inventory Conversion Period</b>	<b>Debtors Collection Period</b>
2012	0.93	0.50	0.64	13.28	33.22	0.60	0.19	28	11
2013	0.70	0.51	0.69	14.38	59.63	0.57	0.16	25	6
2014	0.99	0.53	0.75	13.63	63.71	0.55	0.15	27	6
2015	0.83	0.48	0.74	16.46	91.23	0.43	0.13	22	4
2016	0.79	0.45	0.76	13.81	87.34	0.37	0.15	27	4
2017	0.89	0.35	0.69	10.20	42.46	0.37	0.17	36	9
2018	0.93	0.38	0.70	11.28	45.72	0.37	0.16	32	8
2019	1.03	0.47	0.74	13.74	44.38	0.40	0.16	27	8
2020	0.90	0.43	0.53	13.87	54.84	0.32	0.14	26	7
2021	0.85	0.38	0.89	8.65	29.58	0.36	0.22	42	12
Average	0.88	0.45	0.71	12.93	55.21	0.44	0.16	29	7
SD	0.097	0.061	0.09	2.257	20.90	0.10	0.025	5.926	2.72

**CONCLUSION**

From the study of the working capital utilization, it is found that BPCL should concentrate on each constituent of working capital so as to maximize its profits and improve its liquidity position. Overall it is found satisfactory.

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# EVALUATION OF HEALTH CARE SERVICES AT PRIVATE HOSPITALS DURING PANDEMIC-- A SERVPERF APPROACH

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## Abstract

**Purpose** – The purpose of this research is to measure the service Quality and its impact of patients' satisfaction.

**Methodology** – SERVPERF, a scale developed and validated by Cronin and Taylor (1994) is adopted to measure the service quality. A sample 269 data were collected from the customers of private hospitals. Scales used were tested for their model fit. Correlation and Regression were used to analyse the outcomes.

## Findings

The research results reveal that the dimensions namely reliability, tangibility, responsiveness and assurance are greatly influencing Customer satisfaction and empathy is not significant in its impact. There is no significant difference on service quality based on the demographic profile of customers.

## Research Limitations

This research focuses only on the service perception and further research can be initiated by considering customer loyalty and switching behaviour and an effect of service quality.

## Practical Implications

The results derived in this research is useful in taking decisions on service delivery in most effective ways and frame strategies to strengthen customer satisfaction by private hospitals.

**Key Words:** Health Care Services, Service Quality, Service Perception and Customer Satisfaction

## INTRODUCTION

The entire humanity world- wide faces naval coronavirus called COVID 19 on Dec 2019, which resulted in effecting public health and dramatic loss of human health. During pandemic frontline health care workers (HCW) who plays a crucial role in providing care to infected public. Despite of this HCW faced unprecedented several mental health issues such as anxiety, depression, burnout stress related disorders. Above the all HCW are overloaded work beyond their capacity which increases case of dearth and medical issues, other major challenges faced by HCW is with low resources setting they have to frame the strategies such as curtailment of routine out and inpatient services, postpone electric surgeries, duty shifting, etc. When health systems are overwhelmed so frontline workers fail to access needed care for direct mortality and indirect mortality which leads to a) Misinformation and limitations

on movement that disputes the delivery of healthcare b) Shortage of quality personal protective equipment (PPE) c) Lack of incentives and d) Absence of coordination and proper management during their services.

Health care Service sector in India is having major impact due to COVID-19 pandemic in terms of delivering essential services. The biggest challenge in the beginning was maintaining preventive and curative services to children and aged persons who are more vulnerable. World Health Organisation is coordinating between different nations to access high quality essential services. The approach towards the patients by the hospital employees was completely different in the initial times of pandemic. Many patients were not allowed for regular treatments and sometimes there were provided with basic medicine without medical checkups. This research aims at understanding the customer perception towards service quality of private hospitals.

## **LITERATURE REVIEW**

Mesut Akderea, Mehmet Topb and Sabahattin Tekingunduzc (2018), proposed in their study that the perceived level of service quality have become important component in healthcare sector. For measuring the level of quality of service in different dimensions the SERVPERF model is used. This model demonstrates the growing importance of quality of service in service industries. This study concludes that the Assurance producing highest and empathy producing lowest impact in service quality perception. Suneela Garg, Saurav Basu, Ruchir Rustagi, Amod Borle (2020), stated in their study that the Primary healthcare centers (PHCs) are the first tier of the Indian healthcare system, providing essential outpatient services for the people living in the rural, suburban, and hard to reach areas. The Lower-middle-income countries (LMICs) are facing major challenges during COVID-19 pandemic due to unavailability of health care infrastructure and there is a need of effective planning in health care infrastructure.

Mrs. D. Subashini, Dr. S. Poongodi, (2015) stated in their study that it is important to have knowledge about patients perception in health care quality for initiating reforms in health care sector and satisfying the customers become important task for health care service sector. By using the SERVQUAL instrument as testing tool it is found that the “Responsiveness” having high impact in maximising level of satisfaction of patients towards health care service. Fan L-h, Gao L, Liu X, Zhao S-h, Mu H-t, Li Z, et al. (2017), stated in their study that the relationship between Doctor and Patient becoming more

important now a days. The Hospitals needs to improve their service quality through reducing conflict between doctor and patient. The hospitals are to understand their service quality it must identify its own competitive advantages and disadvantages. The six service quality dimension model is used for finding the negative gap between patient's expectation and perception and it is found that the largest gap is economy dimension. The hospitals must provide adjust according to situation and should provide constant quality of service to improve their service quality.

Mohammad Ali Abbasi-Moghaddam, Ehsan Zarei, Rafat Bagherzadeh, Hossein Dargahi and Pouria Farrokhi (2017). State that the customer attitude towards perceived quality, accuracy of procedure and constant monitoring of healthcare services are important for to assess the service quality in health care and it is found that to improve the disclosure of information to patient, reduce waiting time in online appointment system for physician and physical environment of clinics to increase patient's positive perception. Isaac Theophilus Ampah, Rabi Sidi Ali (2019) stated that the study aims to analyse the effective quality of service leads to Customer Satisfaction in Public Healthcare Institutions. The institutions have to increase service quality and customer satisfaction for have long-lasting and win-win relationship with customers. They found that the appointment of qualified personnel and adequate funding form government will enhance the service quality and customer (patients) satisfaction in public healthcare institutions.

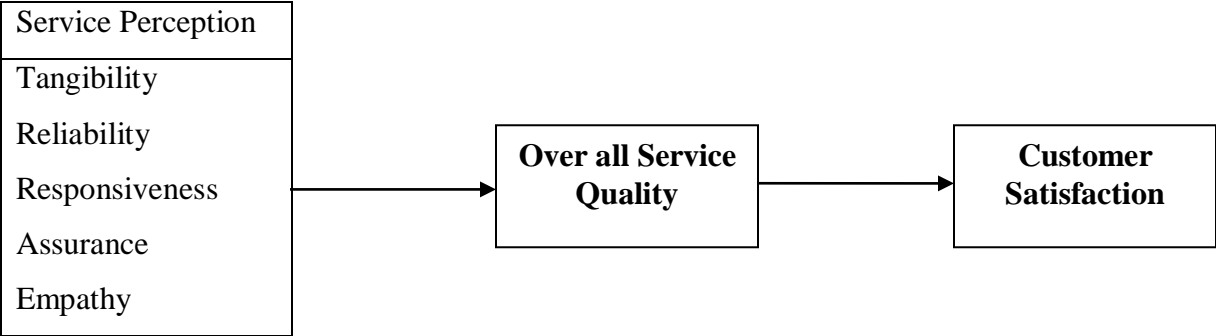
Vishal Kamra, Supreet Kaur Sethi, J. K. Sharma (2019), this study aims to compare quality healthcare service in private with public hospitals. "Zero defections" a new concept introduced by hospitals to cater service excellence. It is found that the tangibility in location, equipment, personnel, parking space etc. are playing important role in service quality and the public hospitals needs to concentrate more on these components to provide quality of service. Muhammad Shafiq, Muhammad Azhar Naeem, Zartasha Munawar, and Iram Fatima (2017) remarks that based on nature and ownership the hospitals vary in terms of their resource availability, speciality and services offered. The SERVQUAL instrument is used to find the service quality gap. It is identified that there is a need assess the customers for to improve their quality of service.

Ching-Sheng Chang, Su-Yueh Chen and Yi-Ting Lan (2013) proposed that in service sector the interpersonal interaction is becoming important element and it influence the trust on service quality and customer satisfaction, this study try to bridge the gap in service quality with an evidence based practice. In this research it is identified that the medical care institutions work with 'customer-oriented'

operational philosophy to develop ‘customer value’ and also work towards the objective of customer satisfaction through customer perception. Nhi Xuan Nguyen, Khoa Tran, Tuyet Anh Nguyen (2021) reveals that the service quality dimensions are analysed and how it influence in patient perceived value, customer satisfaction and loyalty in private healthcare service. The Doctors and nurse and well qualified and offering high quality service even though many studies stated the healthcare lacks in patient satisfaction. The healthcare service sector must follow patient-centered design for satisfying the customers. It is found that, for inviting new customers the private hospitals must have focus on social media and post treatment service too.

Suzana Markovic, Dina Loncaric, Damir Loncaric (2014) states that in Croatia, the Specialty hospitals and health spas operates as the non-profit sector, but trying to provide their services to healthcare tourism market. To participate the in that they should adopt new business philosophy and this created the need for ‘customer-oriented’ and more focus on service quality and satisfaction. In this research it is found that the patients are more conscious about cleanliness and neatness in equipment and environment and expecting more professionalism in service offering. Dr. Darshana R. Dave, Reena Dave (2014) proposed that, in India households spending is more than public spending. Aim of the study is to identify the effect of service quality in customer (patients) satisfaction and loyalty in private hospitals. After Second World War in some countries like Eroup, Africa and Asia the healthcare sector took part in economic development. It is identified that healthcare service provide must offer correct information time to time, need to have convenient operating hours and must give individual attention and also to develop a strategy to provide quality of service.

**CONCEPTUAL FRAMEWORK**





## RESEARCH METHODOLOGY

The patients who have recently experienced the services at private hospitals were contacted to collect the primary data. An on line survey was conducted to collect the data. The researcher has adopted SERVPERF model which has five dimensions and 22 items to measure perception on service quality. Lahore, et al's (2004) customer satisfaction measure is adopted. Face validity was conducted with 20 customers of private hospitals and few questions were rephrased for better understanding of customers. A descriptive study was conducted to find out the impact of service perception on service quality and its impact on customer satisfaction. In order to attain the major objectives statistical tools namely Anova, t test, Correlation and Regressions were conducted using SPSS 21. The Cronbach's Alpha value for the 22 items of servperf scale was examined and found .763 which represents that the scale adopted is more reliable for this set off respondents and data.

## RESULTS AND DISCUSSION

### *DEMOGRAPHIC PROFILE OF THE RESPONDENTS*

The sample shows that 58% of participants were male and 67% of them fall in the age group of 50 – 60 years. Among the respondents 83% of them have completed atleast a degree. The occupation of the respondents mostly falls in the category of private employees with 72%. With regard to reasons for availing services, 76% of patients have taken treatment for Covid in the hospital, 12% of patients for general checkup the remaining patients for treatment like dentist, eye and cardiologist.

### **DIFFERENCE IN PERCEPTION OF SERVICE QUALITY**

	F	Sig.
Gender	1.018	.315
Age	.389	.816
Occupation	1.253	.287
Income	.573	.235

**Table1. Difference on perception of Service Quality based on demographic profile**

The results reveal that there is no significant difference in the opinion of customers based on different demographic profile towards service quality perception. Since the significant values are higher than the standard value .05, the null hypothesis is accepted which means there is no significant difference.

## SERVICE QUALITY AND CUSTOMER SATISFACTION

Regression analysis is used for test the level of influence of service quality Dimensions on Customer satisfaction. The dimension with the largest coefficient represents the most important dimension in terms of its influence on customer satisfaction. The next largest coefficient represents the second most influential dimension and so forth.

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.822	0.676	0.675	0.582

**TABLE 2. REGRESSION SUMMARY**

The adjusted R square value was 0.676 which means that service quality dimensions in hospitals account for 68 percent of the variance in “Customer Satisfaction Service Quality”. It represents 32 percent of customer satisfaction is explained by something other than the service quality dimensions. It was observed that the overall regression model is significant ( $F=373.835$ ,  $p<0.00$ ) and hence the model has a good fit.

	Reliability	Assurance	Tangibility	Empathy	Responsiveness
Customer Satisfaction	.870	.789	.684	.122	.883

**TABLE 3. CORRELATION**

The relationship between different dimensions of service quality and their impact was examined in this research for their influence on customer satisfaction at private hospitals. The four dimensions namely reliability, tangibility, responsiveness and assurance have positive impact on customer satisfaction. Empathy is found to be low in private hospitals during pandemic which is the most important factor to be considered for customer satisfaction in health care industry.

## CONCLUSION

The impact of service quality perception plays a vital role in determining customer satisfaction. The demographic profile is not showing any difference on perception towards service quality of private hospitals. Future research can focus on different cultural settings. This research can be further used by the private hospitals for framing the policies to take at most care in maintaining empathy during all service encounters.

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## FOOD RECYCLING INTO ON-CAMPUS COMPOSTING–GREEN CAMPUS INITIATIVE IN EDUCATIONAL INSTITUTION

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### ABSTRACT

*India currently faces an urgent environmental crisis (even in the world). The Green Campus Initiative is one of the ways in which India's environmental challenges are being addressed. By creating more sustainable campus practices, our institution can demonstrate to students that the importance of environmental stewardship so they can bring these lessons to others outside the campus community. To reach the goals of a sustainable campus, we must act on “closing the loop to become a self-contained facility that grows its own food, and recycles its own waste’.*

*The vermi culture act as an innovative supportable technology for the treatment of waste as it holds a futuristic contribution in the field of waste management. Nowadays vermiculture is successfully applied in the solid waste management. The eco-friendly process of vermicomposting act as a considerable way for reducing wastes, production of fertilizers and the balance towards maintaining ecological environment.*

*The study also inveterate that the vermicomposting can yield high-quality fertilizers which are better related to other commercial fertilizers in the market. The study endorses adequate time should be allotted for the project in order to uphold it towards its justifiable development. The objective of this paper is to promote the adoption of this method in college campus by effectively utilizing the food scraps from College canteen, Hostel kitchen Dining Hall and Catering Food Lab into On-campus Composting. The study aims to bring cost savings to our institution by reducing the amount of food scraps going to landfills into composting facility. To take a step further, this study provides the opportunity for new, innovative hands-on learning experiences rather than traditional text-book and lecture learning.*

## **INTRODUCTION:**

India is desperately seeking solutions to several environmental challenges that have undermined overall health and wellbeing. These challenges are related to contamination of air, water and soil, vulnerability of regions to climate change and extreme weather events, resource inefficiency and wastefulness, and erosion of local biodiversity. There are large number of institutional campuses of varying shapes and sizes—schools, colleges, etc.—which can adopt a system wide approach to environmental sustainability, promote environmentally responsible practices and behavior, experiment with innovative solutions, combine learning and practical application, and add educational values. Simple steps and a collective environmental audit can reduce waste and promote local greenery to conserve biodiversity. This can even lead to curriculum based hands-on problem- solving experience for the campus residents while promoting real life work experience and education. The green campus movement can unleash unprecedented transformation if achieved at a scale. More and more Institutions are acknowledging green sense and are now aiming to reflect it in day-to-day practices on the campus. They are transforming places of formal learning into low carbon habitats that are resource prudent and less wasteful. Even the governments are supporting this transformation with their guidelines and mandates. For instance, Ministry of Environment and Forests and Climate Change is shaping its programme on green campuses. Indian government's National Assessment and Accreditation Council (NAAC) has included an environmental sustainability criterion in their rating of educational institutions.

## **KEYWORDS:**

**Composting, Sustainable, Efficiency, Biodiversity.**

## **OBJECTIVES**

- To effectively utilize the Food Waste from College canteen, Hostel kitchen Dining Hall and Catering Food Lab into On-campus Composting.
- To promote sustainable activities among college students who can bring changes in the society as they have enough enthusiasm to get things done.
- To impart Organic and sustainable agriculture trends within students.
- To transform the college into Sustainable and an Eco-friendly Green campus.
- To develop the new age Entrepreneurial skills within Students
- To Educate the students regarding the significance of Organic foods which is a need of an hour in post COVID-19 scenario.

## **COMPOSTING**

About 35%–40% of the municipal solid waste generated in India comprises of organic waste. One of the oldest ways to recycle the waste is by means of composting. The manure which is obtained through this decomposition will be rich in nutrients and it's a natural process. The production of manure is by applying natural phenomenon of decomposition. The compost includes the organic manure such as Nitrogen, Phosphorous and Potassium which is act as a nutrient for plants. It is the way to recycle the yard and kitchen wastes, and is a critical step in reducing the volume of garbage needlessly sent to landfills for disposal. The amount of disposable garbage is reduced and it is the way of reduction of the kitchen wastes as well the recycle of yard. Instead of chemical fertilizer organic fertilizer can be used for farming. The ability of the soil to hold the water can be increased by applying this organic manure and help to cultivate by retaining the soil with more organic nutrients.

### **TYPES OF COMPOSTING AND UNDERSTANDING THE PROCESS**

Composting Basics.

Onsite Composting.

Vermicomposting.

Aerated (Turned) Windrow Composting.

Aerated Static Pile Composting.

In-Vessel Composting.

The two ways by which the composting can happen is aerobically and anaerobically. The micro-organisms oxidize organic compounds to Carbon di oxide, Nitrite and Nitrate during the aerobic composting aerobic. Due to exothermic reaction, temperature of the mass rises the carbon organic compounds is used as a basis of energy while nitrogen is recycled. During anaerobic process, the anaerobic microorganisms break down the organic compounds through a process of reduction.

The Methane and Carbon di oxide are the gases evolved during this process. The temperature of composting does not rise high but a small amount of energy is released and the anaerobic process is a reduction. Composting in pits an aerobically is called as Bangalore method. The composting by aerobic system can be done either through manually or mechanically in a open window, pits or enclosed digesters. Open window system is preferred in tropical region, while in temperate region closed digester system is used.

The Indore method is a kind of pit composting. The most of kitchen waste can be digested using this method which in turn bedding material into high quality castings which can be added to the soil and used on house plants, vegetable seedlings and flowers. Vermicomposting (worm composting) systems

are modest to uphold. The time taken for this process is very less as well as less effort is required. Upholding an bounded bin exactly for 'vermicomposting' is an excellent way to take care of food wastes. With the prohibiting of holes for drainage and aeration, worm bins for covered use are typically totally surrounded, with a lid of some sort to cover the top.

## **COMPOSTING BASICS**

There are five chief extents that necessity be “controlled” throughout composting.

### **Feedstock and Nutrient Balance**

Composting, or controlled decomposition, needs a appropriate steadiness of “green” organic resources and “brown” organic resources. “Green” organic material comprises grass trimmings, food leftovers, and dung, which contain bulky amounts of nitrogen. “Brown” organic materials comprise dry leaves, wood chips, and branches, which contain large quantities of carbon but little nitrogen. Procurement the right nutrient combination necessitates experimentation and endurance.

### **PARTICLE SIZE**

Grinding, chipping, and shredding materials upsurges the superficial area on which microorganisms can feedstuff. Smaller elements also yield a more similar compost mixture and progress mass filling to help uphold optimum temperatures (see below). If the units are too small, however, they strength prevent air from graceful freely through the mound.

### **MOISTURE CONTENT**

Microorganisms living in a dung mound require sufficient dampness to endure. Water is the important element that assistances transport materials within the compost pile and kinds the nutrients in organic material available to the microbes. Organic material contains some dampness in varying amounts, but moisture also strength come in the form of rainfall or deliberate watering.

### **OXYGEN FLOW**

Rotating the pile, insertion the pile on a sequence of pipes, or including bulking agents such as wood chips and shredded newspaper all assistance ventilate the pile. Ventilating the pile permits decomposition to happen at a quicker rate than anaerobic circumstances. Care must be occupied, however, not to deliver too abundant oxygen, which can dry out the pile and obstruct the composting procedure.

### **TEMPERATURE**

Microorganisms require a convinced temperature variety for optimum activity. Certain temperatures support fast composting and abolish pathogens and weed seeds. Microbial activity can increase the temperature of the pile’s core to at least 140° F. If the temperature does not increase, anaerobic conditions (i.e., rotting) occur. Controlling the preceding four factors can bring about the appropriate



temperature.

## **ONSITE COMPOSTING**

Organizations that are successful to manure small amounts of wasted food can compost onsite. Composting can meaningfully decrease the amount of wasted food. Yard accompaniments and small quantities of food leftovers can be composted onsite. Animal products and large quantities of food leftovers are not appropriate for onsite composting.

## **FACTORS GOVERNING THE COMPOSTING PROCESS**

There are various factors, which governs the composting process. They are as follows:

Temperature

pH

Moisture content

Carbon: Nitrogen ratio (C/N)

Inoculums

Oxygen supply / Aeration

Insect control

Odor

Microbial aspect of composting

Time required for composting

## **DATA ANALYSIS AND METHODOLOGY**

Analysis of food waste generated at Hindusthan campus:

- The waste food accumulated from the girl's hostel and boy's hostel is dumped into the pit which is situated behind the hostel area.
- It has directed to breeding of mosquitoes in the neighborhood of hostel and is distressing the health of the students severely. Similar is the situation for the canteen as well.
- To examine how each person subsidizes to the food waste produced in the campus, we had conducted a survey for fifteen days and from this we got to know the total amount of food waste generated daily in the Hindusthan's campus. The output for the survey are listed in the below table.

**TABLE NO. 01: DETAILS OF QUANTITY OF FOOD WASTE GENERATED DAILY**

Sr. No.	DATE	QUANTITY OF FOOD WASTE(Kg)		
		GIRL'S HOSTEL	BOY'S HOSTEL	CANTEEN
01.	05/07/21	12.33	23.29	21.25
02.	06/07/21	12.40	24.76	22.86
03.	07/07/21	11.75	22.76	20.22
04.	11/07/21	13.46	25.28	21.88
05.	12/07/21	11.32	21.35	20.24
06.	14/07/21	10.98	21.88	20.54
07.	18/07/21	11.23	23.56	22.91
08.	19/07/21	12.62	25.18	20.53
09.	20/07/21	10.86	22.36	21.67
10.	21/07/21	11.54	24.30	22.43
11.	25/07/21	11.55	21.53	20.90
12.	26/07/21	10.86	21.65	20.45
13.	27/07/21	11.50	23.50	22.73
14.	03/07/21	12.26	25.27	20.95
15.	04/07/21	10.90	22.60	21.40
	AVERAGE	11.70	23.28	21.40

## **MATERIALS AND METHODS**

### **MATERIALS:**

The various food wastages such as bread, potato peels, onion peels, rice and carrots were used for vermicomposting during this experiment. Manyuchi et al described the vermicomposting methodology in detail.

## B.METHODS

The several food wastes were vermicomposted over 30 days using *Eisenia Fetida* earthworms. The vermicompost and vermiwash formed from different food wastes were examined for the nitrogen, phosphorous and potassium (NPK) composition. The measurement of nitrogen content was measured by the Kjeldahl method (AOAC-920.87), whereas the phosphorus content was measured by the Gravimetric Quimociac method (AOAC-962.02) and the potassium content was measured using a Shimadzu 6800 atomic absorption spectrophotometer.

### FOOD WASTE ANALYSIS:

**The food waste sample was collected and following parameters were studied:**

Moisture content

Density

Moisture content

- Moisture content of solid waste is usually expressed as the mass of moisture per unit mass of wet or dry material. In the wet mass method the moisture in the sample is expressed as percentage of wet mass of the material. Moisture content of food waste varies between 50-80%.

Procedure

- Accurately weighed 500 gm sample of food waste is taken.
- It is then spread in the pan and kept in the oven for drying. Generally sample is dried at 77°C to 110°C
- After 24 hours, oven is turned off and sample is kept for cooling for about 15 to 20 minutes.
- The weight of the dry sample is taken.

Using the formula the moisture content of food waste is calculated.

$$\text{Moisture content} = \frac{\text{Wet weight} - \text{Dry weight}}{\text{Wet weight}} \times 100$$

Results: The moisture content of the food waste is 75.12%.

### DENSITY

Knowledge of the waste density is essential for the design of all elements of the solid waste management system like storage, transportation and disposal. Density is defined as the weight of material per unit volume. The interest of knowing the density of waste is to access the total mass and volume of waste that must be managed. The density of food waste can be up to 290 kg/m<sup>3</sup>.

#### Procedure

Accurately weighed 500 gm sample of food waste is taken.

Its dry mass is determined.

The dry density is calculated by using the formula.

$$\text{Discarded Density} = \frac{\text{Dry Mass Prepared}}{\text{Volume}}$$

Results: The discarded density of the food waste is 218.246 kg/m<sup>3</sup>

#### **FOLLOWING MODELS COMPOSTING FOR FOOD**

- Aerobic without cow-dung
- Anaerobic with cow-dung
- Aerobic with cow-dung
- Vermi-composting

According to various researchers, cow dung helps to improve the decomposition rate of the food waste.

To confirm those researches, models of anaerobic and aerobic composting with and without cow dung are prepared.

The plastic buckets with 0.02 m<sup>3</sup> i.e., 20 liters volume are used as vessel for the composting setup

**FOLLOWING PRACTICE IS IMPLEMENTED TO FORMAT THE AEROBIC AND ANAEROBIC COMPOSTING SETUP:**

- First volume of bucket is precisely measured.
- With the help of indicator 4 cm thick coatings are marked over the bucket.
- Now the first layer of soil is given inside the bucket up to a thickness of 4 cm as mentioned earlier.
- The second layer of waste is given over the soil layer.
- Same process is continued up to a total height of 28 cm i.e., 7 alternate layers of soil and waste.
- For the setups with cow dung, a layer of fresh cow dung is introduced in-between.
- To maintain the moisture content, water is sprinkled.
- For first six days no rotation is given
- After the first six days, rotations are given after every four to six days.
- No rotations are given for anaerobic composting setups.
- For vermicomposting setup following procedure is adopted:
- First volume of bucket is accurately measured.
- Then the holes are pierced at the bucket bottom so that the extra moisture is removed as it is dangerous to the worms.
- With the help of marker 4 cm thick layers are marked over the bucket.
- The first coating of cow dung is given of 4 cm thickness.
- The second layer of waste is given over the cow dung layer.
- Then the waste layer is given over it followed by alternate layers of cow dung and soil.
- Same process is continued up to a total height of 28 cm i.e., 7 alternate layers of soil, waste and cow dung.
- Then earthworms of species *Eisenia foetida*(red earthworm) are introduced.
- No rotations are to be specified to the vermicomposting as the worms themselves rotate.

**TABLE NO. 02: ROTATION DATA**

Sr.	AEROBIC	AEROBIC	VERMICOMPOSTING
01.	25/07/21	25/07/21	No Rotation
02.	05/07/21	05/07/21	
03.	12/07/21	12/07/21	
04.	16/07/21	16/07/21	
05.	20/07/21	20/07/21	
06.	28/07/21	28/07/21	
07.	03/08/21	03/08/21	
08.	10/08/21	10/08/21	
09.	17/08/21	17/08/21	
10.	21/08/21	21/08/21	

**RESULTS AND DISCUSSIONS****VERMICOMPOSTING:**

The vermicompost was ready to use after a month. The texture of the compost was perfect. The worms were found to be healthy. It can be concluded that vermicomposting is best alternative for food waste composting.

**AEROBIC COMPOSTING:**

According to the literature available, aerobic composting requires 2 months duration for completing the entire process. The model under study was analyzed for one month. Hence, required time was not given to the model for completing the composting process. Hence the compost was not ready after a month.

**ANAEROBIC COMPOSTING:**

Anaerobic composting requires at least four to six months for the entire reduction of waste. The model was prepared for a month analysis. Thus, the model under study did not give the expected results.

## CONCLUSION

The objective of the project was to analyze the current food waste management in Hindusthan's campus and put forward a new and effective alternative for food waste management to reduce the nuisance caused due to food waste dumped openly in the campus.

For the food waste it was observed that the suitable waste disposal method is vermicomposting. It is a quick and easy to maintain and operate composting method. Aerobic and anaerobic composting are time consuming processes.

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